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MODEL Airplane NEWS

100 YEARS OF RADIO CONTROL MODELING

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U COULD WIN! . . .

r $3,000 in prizes—enter the "Grand Brands" Sweepstakes

Celebrating the RC adventure

Can you imagine powering up the massive radio transmitter mounted in the back of the automobile shown below? How about simply transporting it to the flying field without breaking any vacuum tubes?! This impressive piece of gear, designed by Joseph Raspante before WW II, is shown on Long Island as Joseph and a flying buddy prepare to set up a modified Buccaneer (Berkeley Models kit) for an early era RC flight in 1946.

For a comparison with modern technology, see the image of the Airtronics RD6000, one of the latest generation of powerful programmable radio transmitters. The Airtronics unit is a tiny fraction of the size of Raspante's behemoth, yet today, such technology provides immense capability scarcely conceivable a half century ago.

The evolution of RC equipment is just one of the great chapters in the grand adventure of radio control aeromodeling in the 20th century. Some of our most accomplished aerospace engineers were inspired by model aircraft (as were the Wright brothers), and today's leading research and development in the micro flight arena owes much to the inventions and creativity of modelers. As a salute to the technical strides taken by modelers in this century, we have included a special article in this issue titled "The Century of RC" (page 28). There, Bob Aberle, David Gierke and Nick Ziroli, all well-established experts in the hobby, offer a brief look at the amazing developments of the 20th century—an unfolding adventure that is still gathering momentum today.

HIGHLIGHTS

As the World Wide Web proliferates, so do websites that cater to modelers. There are so many, in fact, that Paula Garwood's summary of some of the best sites is a real time-saver that will help you find many first-rate, informative Web presentations without having to wade through untold hundreds of sites (see page 60).

If your interest lies in giant scale, see Gerry Yarrish's review of the Brison 3.2—a 50cc powerhouse (page 108). For those chasing the micro-flight scene, we offer our "Final Approach" coverage of a pint-size, homemade brushless motor (page 162). Last, but certainly not least, don't miss our annual "Holiday Wish List" (page 56). The products featured represent some of the best offered in 1999; you are sure to find a holiday gift here that will put a smile on that special modeler's face. And if you ARE that special modeler, you'll know which article to leave open on the coffee table ....

See you next millennium!

MODEL Airplane NEWS
FOUNDED 1929

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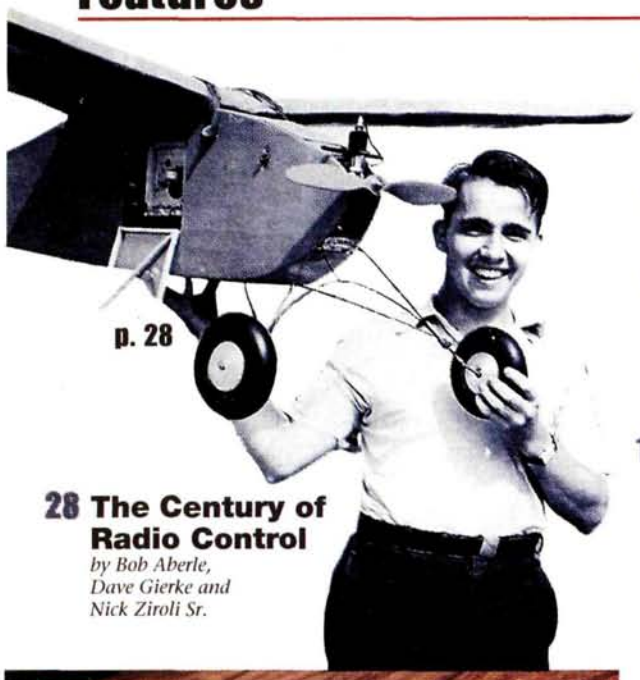
Features



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AIRWAVES

Our readers write back

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," MODEL AIRPLANE NEWS, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

FOKKER FINISHES

I hope that this is the place to ask a question. I am building a 1/5-scale Fokker Dr.1 from Bob Holman Plans. This rendition of the airplane uses formed, 1/8-inch aluminum tubes for the rudder and all other surface trailing edges. It works well for this application and can be formed with ease. I had planned to cover the airplane with Coverite's 21st Century prepainted fabric to simulate the cloth finish used on WW I aircraft. Now, here is the problem.

The Coverite adheres just fine to all-wood parts but will not stick to the aluminum. I have tried every trick I have learned in 55 years of building model airplanes, and nothing works. To date, I have tried painting the aluminum tubes, adding a base layer of silkspan (1/16-inch strip) to the outer face of the tubes, and also adjusting the temperature of the iron, all to no avail. I even "etched" the tubes prior to assembly to provide "tooth"; this didn't work, either. Perhaps you folks can suggest a fix. [email]

LARRY SIMMS

Larry, I agree that aluminum-tube edges on the control surfaces are very scale-like. Unfortunately, 21st Century fabric, for all its other merits, doesn't bond very well to the smooth surface of aluminum tubes. In my opinion, a better choice would be Stits Lite cloth and Poly Tack adhesive from F&M Enterprises; I just finished covering a VK Fokker triplane with this material and paint. Stits Lite is a lighter version of the same cloth used to cover full-size aircraft, and I find it works very well applied over all types of surface materials. After cleaning the aluminum tubes' edges with MEK (or alcohol), brush on the Poly Tack adhesive and apply the cloth while the glue is still wet. Work in small sections and allow it to dry before moving to a new section. The glue dries very quickly. Stits Lite cloth shrinks very well, and you will find that you can achieve a beautiful, wrinkle-free surface with very little effort. The primer, silver coat and paint in the Stits Lite line are also easy to apply, and since they are polyvinyl, they go on just like dope (sprayed or brushed). Though Stits Lite is more expensive than prepainted, iron-on 21st Century fabric, I think once you try it, you'll be hooked—especially for scale models like the Fokker Dr.1. GY

IDLING ENGINES

I have enjoyed reading Randy Randolph's articles for some years. His evaluations make sense and match my experience. His approach to breaking in engines—ABC versus ringed—has helped me to get better performance from the engines I have purchased.

I have one problem that I can't solve, and that is getting a good transition to idle. I have an RJL 60, a K&B 61 and a Royal 28 that behave perfectly; I also have a Magnum 75 and a SuperTigre 75 that don't. Why don't they slow down to idle without a delay? This delay is not predictable, and it sometimes makes landing difficult. I would appreciate any insight into this problem. [email]

RON ROSENBOHM

First, you must remember that I am a small engine man, and my experience with .60-size (and larger) engines ended sometime in the 1970s. You did not state the conditions under which the uncooperative engines were operating. Do they perform badly in the same airplanes and using the same fuel as the ones that behave well? When the happy engines are substituted for the unhappy ones, are they still happy, or do they turn nasty in the idle mode?

Normally, when engines fail to idle properly, there is an air leak somewhere in the system, or foaming in the fuel tank/line that changes with the change in rpm, which affects the needle setting. If all else fails, drop a note to the manufacturer describing the problem; he may have a solution because others have had the same problem.

Randy Randolph

SERVO STRENGTH

I just purchased an Ultimate 120 biplane from World Models. It has a 55-inch wingspan and around a 60-inch fuse. I need five servos across four channels (two for the ailerons) and am trying to determine how much torque they should have. Are there any rules to determine this? I've been told that I need 70 oz.-in. servos, but they are so blasted expensive. Thanks.

BILL MATHIS
Thornton, CO

Bill, for a high-powered 1.20-size bipe like the Ultimate, servos with 70 to 90 oz.-in. of torque would be good for a single-servo setup on rudder and elevator. If you use two servos to control the elevator, then a standard 50 oz.-in. of torque on each elevator half is adequate. For four ailerons, I'd use one 50-ounce servo for each surface, or two servos (one in each wing) that have 70 to 90 oz.-in. of torque. Throttle and smoke, if you include them, can use standard or even miniservos. If the price of the servos is a concern, try the servos from the folks at FMA Direct: 9607 Dr. Perry Road, #109, Ijamsville, MD 21754; (800) 343-2934. Their standard "bronze-bushed" S-300 servo is a mere $10.95, while their S-360 pumps out 81 oz.-in. of torque for only $21.95. I have a 3W-60-powered, 30-percent Staudacher equipped with their S-3601 servos; they have 108 oz.-in. of torque. I'm using one servo for each control surface. Also remember that in a high-performance model, you should use an RX battery pack with a good-size capacity (1200mAh or larger) to get the most out of your servos. GY

COLOR SEARCH

I enjoy George Leu's "Scale Techniques" column very much and have had much success trying his suggestions on my models. I appreciate that he gives readers good, to-the-point information without getting into scale politics; who needs it?

In his October 1999 column, he mentioned M&M paint chips for use in documentation folders but did not give a source; could you tell me where to get them? Also, I am interested in Italian WW II fighter aircraft but find almost no documentation on these beautiful aircraft. Where should I start?

AUGUSTUS COE
Scottsdale, AZ

Augustus, M&M color chips are available from our scale friend, Frank Tiano, and his company: FTE, 15300 Estancia Ln., West Palm Beach, FL 33414; (561) 795-6600.

For books on Italian fighter aircraft, check out bookstores such as Barnes & Noble or Waldenbooks. Most stores have computer links to large book distributors and can check on different topics and get the books in for you.

On the Internet, check out www.amazon.com, www.aviationworld.net, or www.chapters.ca. These online book retailers have search engines in their websites that allow you to search for specific books by title, subject, or author. Type in "Italian Fighter Aircraft," and several titles (and descriptions) will come up that you can investigate further. These online bookstores make it very easy to find the books you want. Good luck.

George Leu

IMPROPER PROP TALK

In the October 1999 issue, in the "Product Watch" column on page 118, I stated that Clark Industries offers a 26-inch-diameter, 1/3-scale Sopwith Pup propeller; it's actually 36 inches in diameter. Sorry for the error. GY

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

AIR SCOOP

BY CHRIS CHIANELLI

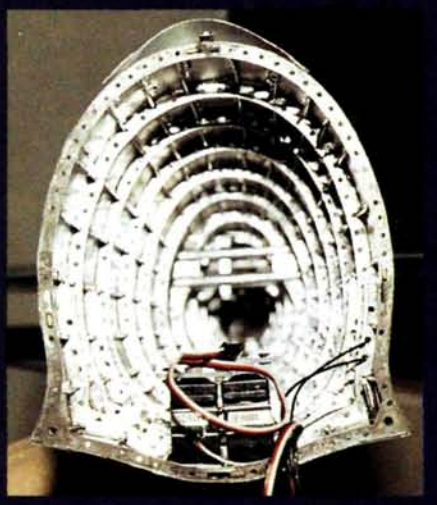
FA-180

The Saito Big Bang Theory

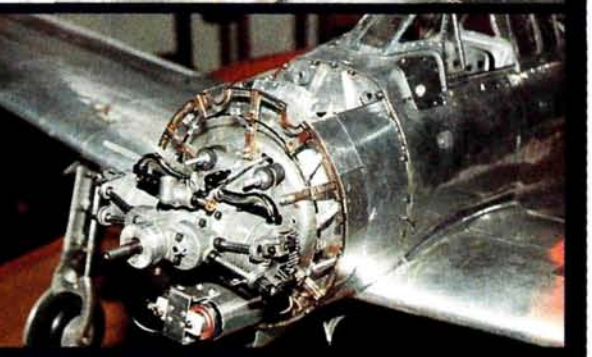
Based on the powerful Saito 1.50, this larger 1.80 should handle really large props for its size! Rumor has it that it will swing an APC 17x8 at 8,900rpm. So if you're looking for serious power in a 1.20-size engine, you might want to check out this new 1.80. Like the 1.50, the 1.80 uses the same crankcase as Saito's FA-1.20 and, of course, it will fit into all models designed for 1.20-size power. The FA-180 has exactly the same mounting-lug dimensions and mounting-hole-to-thrust-washer measurements as the .120 and .150. Only the height dimension is slightly different; it is an additional 2mm high at the valve covers. At 31 ounces, with muffler, the new .180 weighs just an ounce more than the .150.

Like other Saito engines, the .180 is available in the standard natural finish or in a Golden Knight version with a high-gloss black finish and gold valve covers.

Horizon Hobby Distributors Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511.



Sacho's Zero



I thought you guys would like to see what the sacho (president) of Saito engines is working on in his shop. Mr. Gen Saito's interests don't stop at producing great-running 4-stroke engines. This aluminum Zero with fully stressed skin is an engineering masterpiece. It is exact scale, features many internal scale structures and is powered by a Saito FA-300 twin—of course. And yes, it is fully equipped with radio gear and is intended ultimately for flying. No wonder Saito engines are so reliable and powerful. The president—I mean sacho—is a modeler, just like you and me!

Saito Engines, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; website: www.horizonhobby.com.

KYOSHO F-16

Kyosho's electric ducted-fan T-33 was such a resounding success that it won Model of the Year in both America and Europe. Now the company has followed it with this F-16. The model is 43 inches long, has a 36-inch wingspan and uses the same fan unit as the T-33. If it flies anything like the T-33 does, Kyosho will have another winner on its hands.

Kyosho; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008.

Turbo Bee

A daydream come true?

I'm either clairvoyant or just "plane" lucky; I was just dreaming things up when I wrote the November "Air Scoop," and I mentioned a "Fan-Bee"—but look! Here it is! Clancy came up with something that's even wilder than my imagination. This looks like Flash Gordon's Bee! My field spies captured these shots straight from Clancy Aviation's "Bee" hive in Arizona. Its working name is the "Turbo Bee"; it has a 36-inch-span sorta delta-wing. It will come in somewhere between 16 and 30

ounces, depending on the radio and powerplant used.

Not ready to join the "Yellow-Jacket-Jet-Set" just yet?—don't fret. How could you resist this low-wing Golden Age Bee? It sends the cute-o-meter right off the scale. It's an adaptation of the new Yard Bee 29-inch-span wing and the fuselage from the Stagger Bee bipe I showed you last month. The wing fillet and those wheel pants are the icing on this mini-cake. Fair warning to my coworkers here at *Model Airplane News*: don't get between me and the UPS truck when they arrive!

Clancy Aviation, P.O. Box 4125, Mesa, AZ 85211-4125; (480) 649-1534.

YS 120FZ

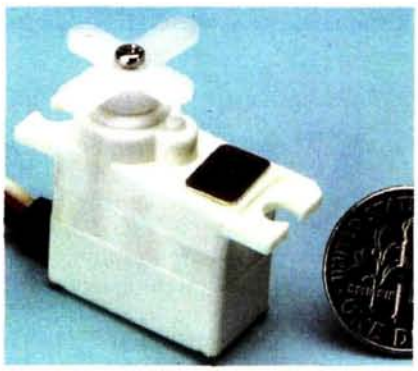
Never satisfied with second place in the 4-stroke performance arena, YS has packed even more power into its 120-size engine and dubbed it the FZ. To obtain its power, the FZ uses a supercharged fuel injection fed by a pressurized and regulated fuel-delivery system. The FZ uses the same crankcase and mounting pattern as the 120NC and other previous YS-120 engines.

To demonstrate the extent to which YS is on the leading edge of 4-stroke, high-performance technology, do you remember the picture of that twin-cylinder, 4-cam YS engine I showed you in the September '99 "Air Scoop"? To my surprise, it turns out that this awesome engine is, in fact, quite old. How old, you ask? This 8-valve work of high-performance art, which was never produced, was designed before YS's first supercharged 120 went into production! That should give you some idea how far ahead YS is in the performance game.

YS; distributed by Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92723-9767; (949) 455-9888; fax (949) 455-9899.

Ace in the Hole

Ace's face has entered the small-servo race. At only 9g, its new model 8112 is ideal for micro applications. Using a 4.8V pack, and for about $20 each, the little white wonders put out 11 oz.-in. of torque with a 0.11-second transit time.



Ace Hobby Distributors Inc., 116 W. 19th St., Higginsville, MO 64037; (660) 584-7121; fax (660) 584-7766.

Fast Response B2

Megatech's new, ready-to-fly B2 showed up at my office door at 1342 hours on a sunny day. By 1417 hours that same sunny day, I was "wowing" a crowd that had formed as I flew the Stealth in the baseball field behind our building. And let me assure you, this "instant gratification" R/C machine does fly well—*very* well, thank you.

I know some will disagree, but I think we need more no-hassle, scale-like, entry-level products like this one; not only for us to have fun with, but also to draw new people into the wonderful world of radio control airplanes. One of the spectators, a borderline hysteric who knew *nothing* about R/C, was exclaiming, "Please, please, tell where I can get one!" Seriously, he was nearly out of his mind with excitement. For a minute, I thought he was going to throw his credit cards at me!

The B2 can be assembled without any tools or glue and comes with everything needed for flight, including a 3-channel radio, 8.4V rechargeable battery pack and 12V peak-detection charger. Eight AA batteries are all you'll need to add. Onboard features include electronic elevon mixing, low-throttle safe start and auto-shutoff motor circuitry. Specs: wingspan—48 inches; weight—20 ounces; flight duration—6 to 8 minutes.

Megatech, 8300 Tonnelle Ave., North Bergen, NJ 07047; (201) 662-2800.

ARIZONA MODEL AIRCRAFTERS

Aviation Art

The models and model accessories from Arizona Model Aircrafters have often been referred to as "works of art," but now the company is offering exactly that. These high-quality, wood-framed wall-display pieces are just what any devotee of WW I needs in his or her den. The artwork within the sealed casement is hand-painted and simulates that full-scale aircraft look. To further the nostalgic impact, the main piece is presented with other small items of appropriate memorabilia; in this case, a photo of the aircraft, a reproduction Blue Max flight medallion and ribbon and some machine-gun bullets. (The VK-Fokker triplane model is not included.) Available in German, British and French aircraft markings, these beautiful wall displays come ready to hang. Get in the mood—it's time to redecorate!

Arizona Model Aircrafters, 14795 N. 78th Way #800, Scottsdale, AZ 85260; (480) 348-3733.

Quick, Easy & Silent

The electric-powered, 2-meter-span (78.7 inches) Whisper is an ARF made of balsa and other lightweight woods, and it's intended for beginners and sport fliers. It's a stable, relaxing flyer that's easy to see because it comes pre-covered as it appears here. According to Hobby Shack, Whisper excels at climbing and glide performance. The model's thermal soaring capabilities are due, in part, to its light (12.5 ounces per square foot) wing loading. In their testing, using the stock 05 direct-drive motor and a sport Sanyo 1400mAh pack, the Hobby Shack folks were able to climb to a comfortably high altitude three times and had juice left over for final approach and landing corrections.

The fuselage is big enough to hold standard-size receivers and servos and a 7-cell 1200 to 1500mAh (sub-C-size) battery pack. Whisper comes with a high-performance "long-can"-type 05 motor (with flux ring) and a wide-blade scimitar folding prop.

The 4-panel, polyhedral wing is hand-built of balsa and has hardwood spars. Lightening holes have been cut in the D-tube leading edge to reduce weight without sacrificing airfoil integrity or strength. Specs: wingspan—78.7 inches; wing area—596 square inches; wing loading—12.5 ounces per square foot; flying weight (standard-size equipment)—51.7 ounces; radio required—3-channel.

Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.

AstroFlight 90—*A single triumph?*

When this squad of students from Oklahoma State University traveled to Maryland for the third annual Design, Build and Fly weightlifting competition (see the September '99 "Final Approach"), they earned the distinction of being the only team to achieve the maximum takeoff weight of 55 pounds. Amazingly, the collegians used only one motor to accomplish this feat: a geared AstroFlight 90 with Astro's 204 speed control. Could there be any better testimonial to power? The O.S.U. team carried more weight per sortie than its rivals, and the only team that bettered O.S.U.'s total weightlifting effort used *three* motors! What I want to know is: who soldered together the 44-cell battery pack?

PILOT PROJECTS

A look at what our readers are doing

SEND IN YOUR SNAPSHOTS. ***Model Airplane News*** **is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.**

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

SCRATCH-BUILT SOPWITH

Larry Klingberg of Huntington Beach, CA, took almost 1½ years to build this ⅓-scale Sopwith Schneider, the full-scale version of which was designed in 1919. Larry even designed it using his own plans, with Bob Hirsch 3-views as his guide. Larry covered his plane with Solartex covering followed by Sig butyrate dope, Rustoleum spray paint and MonoKote graphics. A 5.8ci Sachs engine will power this 53-pound creation, as soon as Larry's busy schedule allows him the luxury of flying it.

DOUBLE BUBBLE TROUBLE

In the Battle of Midway, the full-scale version of the Navy's PBY Catalina made an appearance, and George Malos has captured its unique look with the help of a GTP Sales kit. George further modified his plane by adding custom-made retracts, Spring-Air wing floats, a McDaniel onboard ignition system and two SuperTigre 75s. The "Strawberry Nine" flew patrol missions in WW II, and it continues to do so in miniature over the skies of Davis, IL.

THE ARMY'S ANTLERS

This de Havilland C-7 Caribou was scratch-built by Everett Rubendunst. Two 12x8 props and two AstroFlight motors, each with a 3.6:1 Super Box gearbox, are necessary to get this warbird off the ground—after the 18 Sanyo 1400mAh batteries have been charged, that is. With its 8 pounds of thrust and a wing loading of 30 ounces per square foot, Everett understandably gets a bit nervous when he flies his plane in the skies over Foster, RI, but the crowd must love to see it go. Bob Aberle, *Model Airplane News* contributor, kindly provided us with this photo.

ROCKET TO RUSSIA

Designed on Rene Saenz's home computer, this MiG-29 has logged more than 30 flights in all kinds of weather over Houston, TX. Rene used a .60ci engine to give his plane plenty of power. This 6-pound, 620-square-inch model was built using interlocking formers and sides, and maintenance is a snap, as the six servos are positioned for easy access. Another version of this Russian warbird is in the works—this time, with retractable landing gear.

BIPLANE WISHES AND R/C DREAMS

Carl Schurenberg of West Chester, OH, believes that "a *real* plane has two wings and a round engine." In the spirit of his belief, he built his Concept ¼-scale biplane to fulfill his childhood dreams. The 82-inch-wingspan model is covered with 21st Century's light red and bright yellow fabric in the manner that the factory would have used on the original. The 18-pound model is powered by a 38cc gas engine and is outfitted with a dummy engine made with Williams Bros. cylinders. Du-Bro wheels and tailwheel along with a crinkle-finish instrument panel complete this plane's looks.

HINTS & KINKS

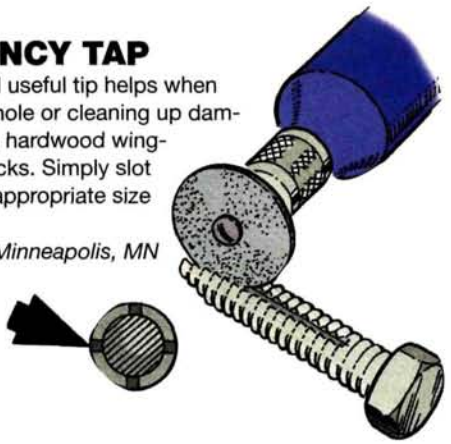
BY JIM NEWMAN

SEND IN YOUR IDEAS. *Model Airplane News* will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

EMERGENCY TAP

This old but still useful tip helps when tapping a new hole or cleaning up damaged threads in hardwood wing-attachment blocks. Simply slot a screw of the appropriate size with a grinder.

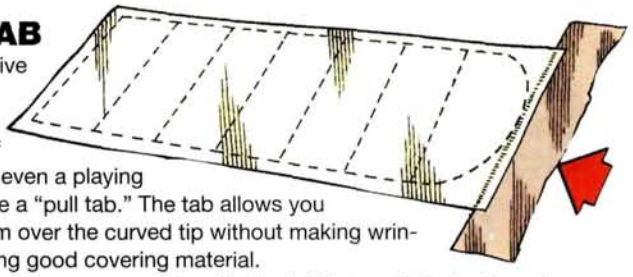
Keith Fagan, Minneapolis, MN



PULL TAB

Save expensive covering film by ironing on a piece of scrap film or even a playing card to create a "pull tab." The tab allows you to pull the film over the curved tip without making wrinkles or wasting good covering material.

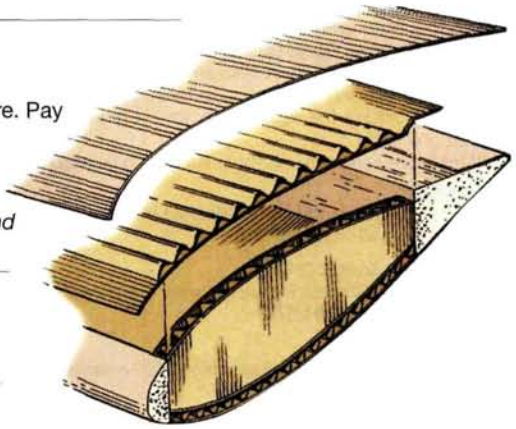
Terry Satchell, Orleans, Ontario, Canada

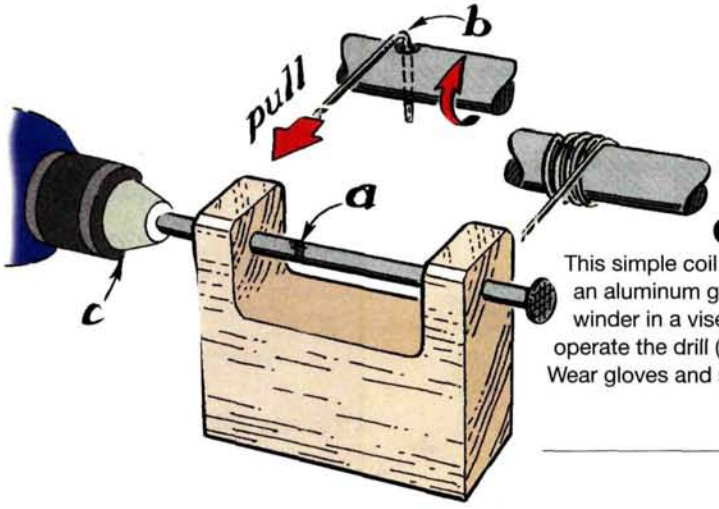


CORRUGATED WINGS

Here's how to make corrugated cardboard wings that do not have flats anywhere. Pay attention to the sketch, because the secret is in using cardboard with exposed corrugations. The plain outer skin is glued on only after the rest of the wing is assembled. Join the sections with wide fiberglass tape and resin as usual.

Fred Walker, Oldham, Lancashire, England





CAPABLE COIL WINDER

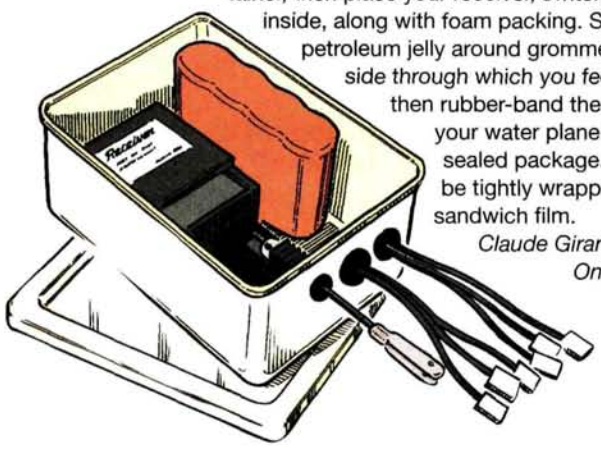
This simple coil winder is made out of any hardwood block, such as maple, and an aluminum gutter spike with a 1/16-inch (1.5mm) hole drilled at (a). Set the winder in a vise, insert a piece of music wire (b) in the hole, then have a helper operate the drill (c) at slow speed while you feed the wire, keeping tension on it. Wear gloves and safety glasses.

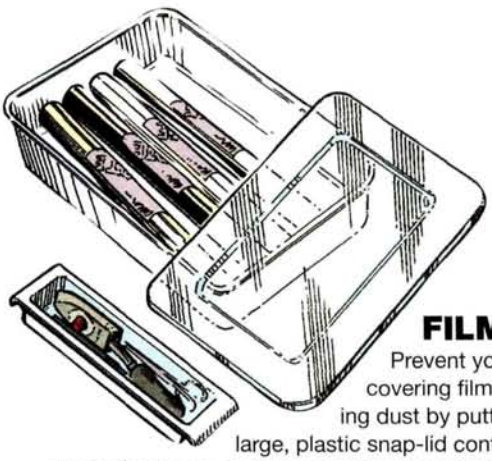
Sam Grice, Sugar Land, TX

MARITIME RADIO

To make a waterproof radio compartment, install rubber grommets in one end of a snap-lid food-storage container, then place your receiver, switch and battery inside, along with foam packing. Squeeze petroleum jelly around grommets on the side through which you feed the wire, then rubber-band the unit into your water plane to make a sealed package. Servos can be tightly wrapped in plastic sandwich film.

Claude Girard, Elliot Lake, Ontario, Canada

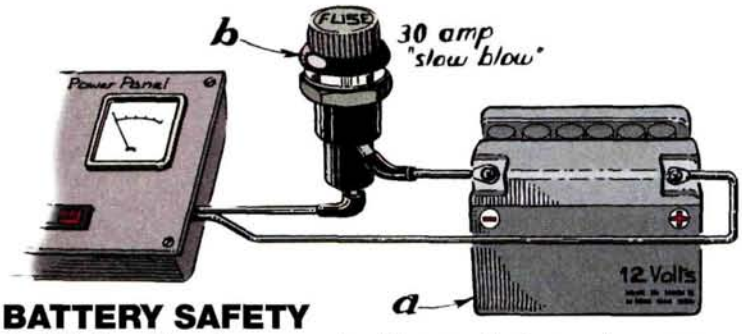




FILM VAULT

Prevent your valuable covering films from gathering dust by putting them in a large, plastic snap-lid container. During the holiday season, these containers can be found at department stores, where they are used for storing gift-wrapping paper. Store film containers in a cool, dark place, where contents will keep well.

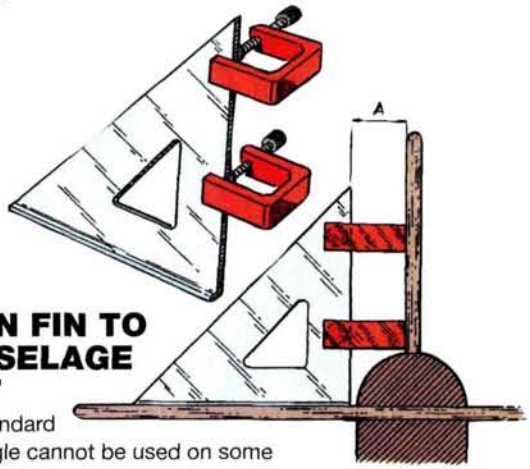
Jim Young, Brighton, MI



BATTERY SAFETY

A 12V battery (a) can turn a wrench red in a couple of seconds, or even ignite your fuel if the starter terminals are shorted across. Install a RadioShack chassis-mount fuse holder (b) onto the front of your flight box, then insert a 30A "slow blow" fuse, which will blow if the terminals are accidentally bridged, protecting you and your materials.

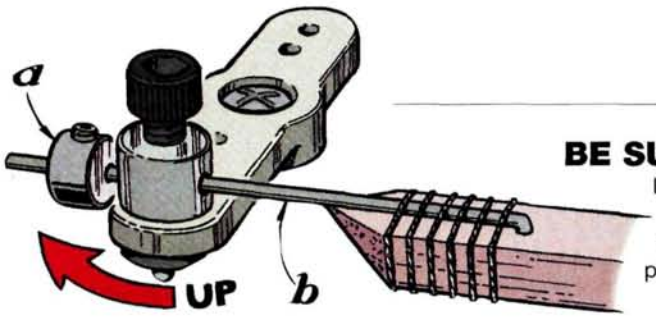
Tony Sokol, East Dundee, IL



FUN FIN TO FUSELAGE FIT

A standard triangle cannot be used on some planes to square the vertical fin because the fuselage interferes, so fit a pair of clamps on a triangle as shown, making sure both are at the same distance (A). Now the offset provided by the clamps will allow the fin to be squared up correctly.

Colin Towers, Medfield, MA



BE SURE OF UP

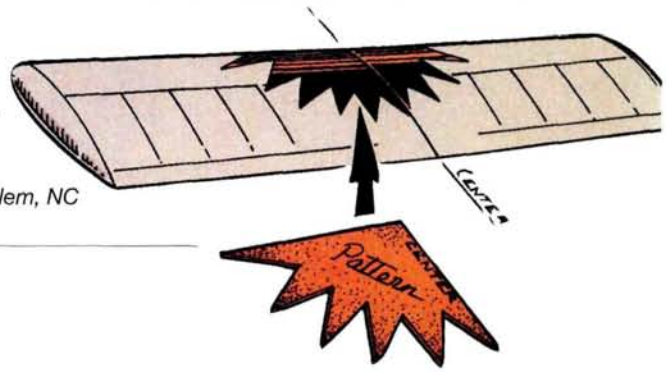
Install a wheel collar (a) on the elevator pushrod (b). If the control-rod connector loosens, you will be able to command, "up-elevator" and prevent the plane from crashing, provided you reduce your power as required.

Roy McGuckin, San Diego, CA

FLIP-FLOP PATTERN

To make your plane's trim symmetrical, cut a pattern out of stiff paper or thin card, and place the template on the covering material. Cut around the template to make the trim for one side, then flip it over and cut around it again to create the other side's trim.

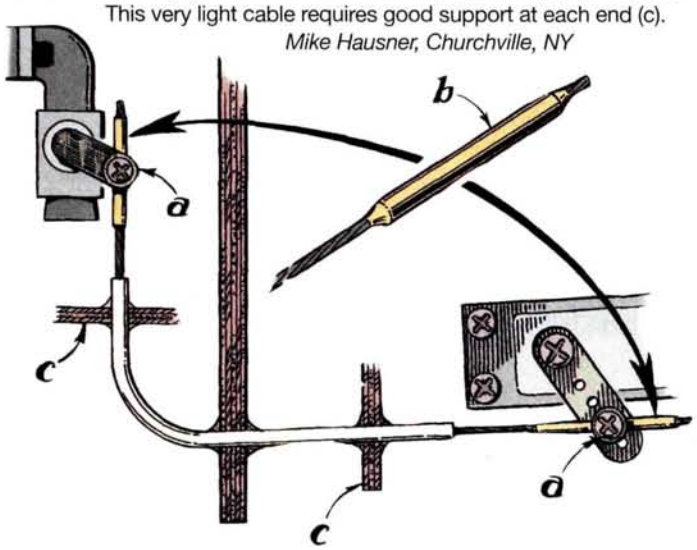
Jesse Williams, Winston-Salem, NC

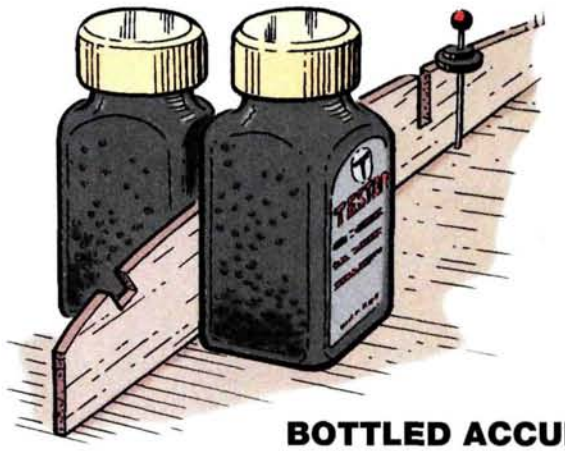


FOUR-STROKE THROTTLE

To minimize friction in the 90-degree turn Mike needed to hook up his Piper's throttle to the servo, he used a Sullivan no. 507 0.032-inch cable, which is more flexible than standard cable. To better fit the E-Z connectors (a), he soldered 0.032-inch brass tube (b) to the ends. This very light cable requires good support at each end (c).

Mike Hausner, Churchville, NY





BOTTLED ACCURACY

Ask your friends who work with plastic models for their little enamel bottles when empty. Clean them out with hot water, fill with lead shot or sand, then use them to hold ribs square and upright.

Nick Zeidler, Wauwatosa, WI

THE CEN

RADIO

by Bob Aberle, Dave Gierke & Nick Ziroli Sr.

The end of the century is a perfect time to reflect on how far our hobby has come, and how it may further evolve. We would be remiss if we looked into the future without first understanding the past, so with the help of noted modeling authorities Bob Aberle, Dave Gierke and Nick Ziroli Sr., we have compiled these highlights of radio-control aviation. From the first production model airplane engine to the latest in microelectronics, the goal of *Model Airplane News* has been to inform, excite and inspire our readers. We hope that this December 1999 issue–the last of the century–will rekindle fond memories for those who participated in the development of model airplanes and help younger enthusiasts appreciate the pioneering efforts of the last 100 years.

We at *Model Airplane News* proudly salute the rich heritage of radio-control modeling and eagerly anticipate all that the next century will bring.

R/C pioneer Walt Good shows off the Big Guff.

1900

1903
Orville and Wilbur Wright's pioneering flights take place above the dunes of Kitty Hawk. By 1905, 30-minute flights had become the norm.

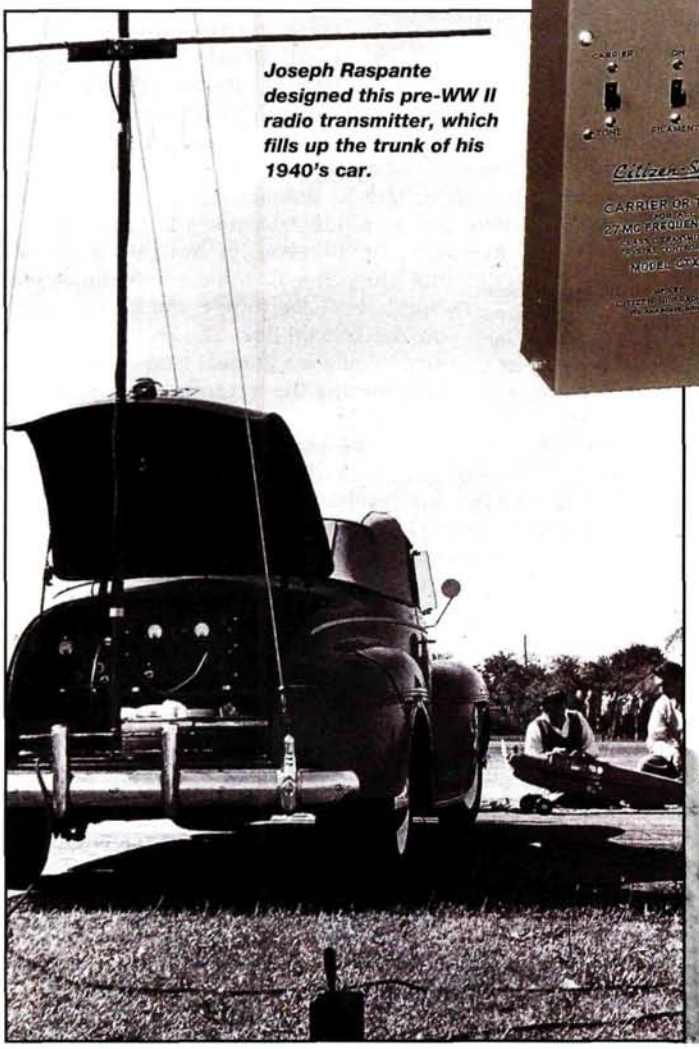
1914-1918
The importance of aviation to the military becomes evident over the trenches of WW I. The biplanes of WW I remain very popular modeling subjects.

1917
"The Red Baron," Manfred von Richtofen, scores 20 of his World War I victories flying the Fokker triplane.

TURY OF CONTROL

RADIOS

by Bob Aberle



Joseph Raspante designed this pre-WW II radio transmitter, which fills up the trunk of his 1940's car.

The popular Citizenship single-channel R/C transmitter of the early 1960s. Again, only one control could be transmitted.

The last century of this millennium marked some of the greatest technological achievements known to mankind. The world of aviation was conceived and flourished during this century. From the Wright brothers to Lindbergh's flight to the landing on the moon and then on to almost routine space flights in the shuttle vehicle, all occurred in a period of less than 100 years.

In that same regard, the world of model aviation has kept pace with full-size aviation and has much to be proud of in its own right. Rubber-powered and hand-launched glider-type models quickly grew to bigger and better things in the early '30s with the advent of a practical model airplane engine, the Brown Jr. Soon thereafter, R/C model aircraft began with the efforts of Clinton DeSoto, Ross Hull and the Good brothers (Walt and Bill).

The WW II years brought the development of the R/C target drones. Efforts in that area led to the commercial development of radio control equipment following the War. At first, it was rudder control only, without even having engine control or remote engine cutoff. Transmitters were large, ground-based units with a long cable exiting from the "box," at the end of which was a single switch. Press it once for right rudder, press it again for left, and so on in sequence. In 1950, you only flew these R/C planes if you possessed a ham radio license.

The inside of a typical 1950 to '55 R/C single-channel transmitter, the majority of which were home-built from scratch. All the coils had to be hand-wound.

1927
Charles Lindbergh—a previously unknown airmail pilot—makes his 33½-hour journey from New York to Paris in the "Spirit of St. Louis," accomplishing the first solo, nonstop transatlantic flight.

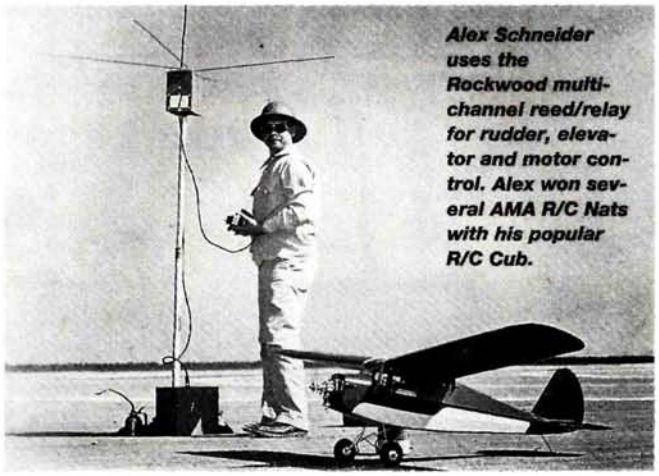
1928
First antibiotic—penicillin—discovered.

1929
Stock market crashes.

Model Airplane News debuts.

Richard Byrd makes the first flight over the South Pole.

Painstaking efforts on the part of the then newly formed AMA R/C Frequency Committee, headed by people like John Worth and Dr. Walter Good, gave us our first R/C channel on part of the citizens band (27.255MHz) back in the early '50s. Now we had a frequency to use that required only a simple permit (not a ham license) and, best of all, we were now allowed to assemble our own R/C equipment.



Alex Schneider uses the Rockwood multi-channel reed/relay for rudder, elevator and motor control. Alex won several AMA R/C Nats with his popular R/C Cub.

I was fortunate to be a young high school student when the R/C boom began in 1952 and '53. Magazine articles began showing all kinds of R/C circuits that allowed modelers to build their own transmitters and receivers. The Miller and Lorenz receivers that appeared in the January and February 1953 *Model Airplane News* were some of the first receivers I built. I clearly remember winding my own coils for the transmitter using a broom handle as a form. I also remember traveling to sidewalk sales on Canal St. in lower Manhattan to rummage through piles of surplus military electronics equipment in my quest for radio parts and components.

An old, unidentifiable single-channel R/C receiver of the '50s (left) with an escapement actuator (right).

We didn't have nice little servos in those days; the actuator (as we called it) was a solenoid device known as an "escapement." It required a twisted rubber band to produce the necessary movement of the model's control surfaces. The sequence-type control was followed by the Bonner compound escapement—an ingenious electromechanical device. With it, you pressed the switch at the transmitter once for right rudder, twice for left rudder and three times to get up-and down-elevator in sequence. Later, the compound escapement was further modified so that a quick blip of control provided high- or low-engine throttle—primitive by today's standards, but it worked. Better still, modelers won early pattern and aerobatics contests with this type of equipment.

Most receivers in the mid- to late '50s employed these little Jaico relays. They proved popular even as single-channel control was replaced by multi-channel reed control.

By the end of the '50s, more progress had been made with the FCC, and five more R/C channels were granted on the 27MHz band. Modelers were eager to get beyond simple rudder-only and compound-escapement control. To that end, the technical experts in our hobby next developed resonant reed multi-channel controls (units such as the Rockwood, Orbit, F&M, Min-X, Bramco and Citizenship). You were able to obtain aileron, rudder, elevator and engine throttle control—in some cases, simultaneously—but the control was not proportional. The controls simply went "hard over" every time you hit the button on the transmitter. The technique necessary to obtain a gradual turn involved carefully pulsing the transmitter aileron or rudder button.

By the early '60s, we began to see the first of the analog proportional control R/C systems, e.g., the Dee Bee Quadraplex and the Sampey. The transmitters for these units were hand-held but extremely large and cumbersome. Motor-driven servo actuators consumed a lot more power than escapements. It was around this time that the R/C modeler was first introduced to rechargeable Ni-Cd batteries. Toward the end of the '60s came two major breakthroughs: the advent of modern-day, digital proportional control along with the FCC's granting of seven channels on a new band using frequencies on 72 and 75MHz.

By the mid-'70s, it became obvious that we still needed a lot more R/C channels, and the now famous negotiations began

The Babcock Co. produced this molded-plastic, single-channel R/C model in the early '60s. In the cutaway, note how much equipment had to be carried in the model just to obtain rudder control. If you look carefully, you can see the escapement's rubber-band motor.

1930

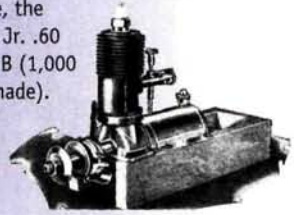
1932
First successful limited-production model airplane engine.

Amelia Earhart becomes the first woman to fly solo across the Atlantic Ocean.

1933
The first round-the-world, solo flight is completed by Wiley Post in a Lockheed Vega.

FDR's New Deal is implemented.

1934
First production model airplane engine, the Brown Jr. .60 Model B (1,000 were made).

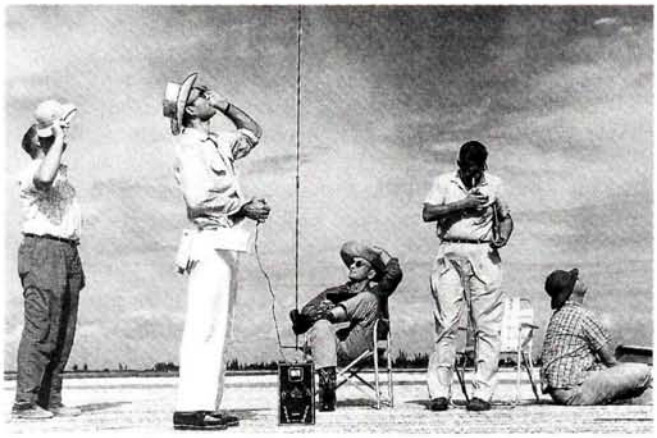


1935
First crankshaft rotary-induction valve production engine, the Baby Cyclone.

1936
Academy of Model Aeronautics (AMA) founded.

between the AMA Frequency Committee and the FCC that culminated in January 1983 with the award of 50 R/C channels for R/C aircraft and 30 more channels for surface vehicles, such as cars and boats. I was chairman of the committee during that time and can tell you it was a monumental team effort on the part of at least a dozen volunteer modelers. Each had a specific assignment, and each did his job well.

With such a large number of newly available R/C channels, the entire hobby grew rapidly, and this led us to our modern-day super transmitters with computer technology enhancement. We also saw the change from AM to FM radio systems and the introduction of pulse-code modulation (PCM), where a digitally coded signal is added to the carrier signal for additional interference immunity. Today, we enjoy narrowband R/C receivers that have essentially unlimited line-of-sight range and selectivity such that an adjacent channel only 20KHz away won't bother them. We have transmitters that can store various control functions in their computer memories and provide all kinds of specialized functions that we never dreamed of 50 years ago! Best of all, these marvelous radio systems now cost far less than they did years ago. Progress has been made in every respect!

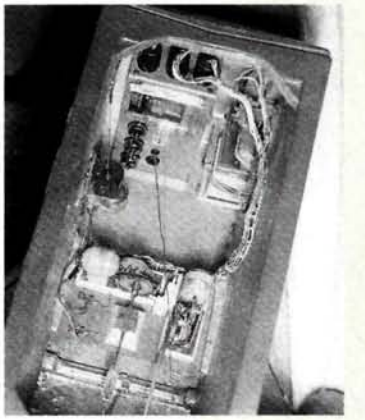


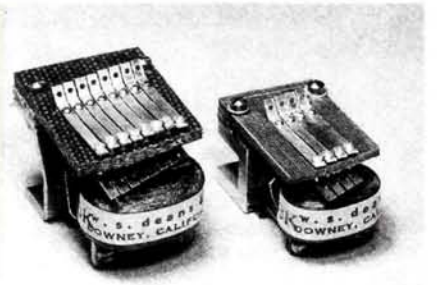
Top: a typical scene at a 1950s R/C flying site anywhere in the U.S. Large single-channel R/C transmitter sits on the ground. Pilot in center holds a switch at the end of a long cable going into the transmitter. Press the switch once for right rudder, let go for neutral, push again for left rudder and so on, in sequence. Above: Howard Bonner assembles his famous compound escapements. Howard went on to design and manufacture one of the first digital, R/C proportional control systems—the Bonner Digimite 4RS.

Besides the field of R/C, our electrical wizards were kind enough during this past century to introduce us to a practical form of electric-powered flight. Threads of this special power source were formed as far back as 1938 with the publication of 3-views of Herb Lozier's experimental gas or electric model. Herb had converted an electric-powered auto horn into a motor of sorts.

The first electric-powered R/C model flight took place in Great Britain in June 1957, courtesy of Col. H. J. Taplin. The model had an all-up weight of 8 pounds and

A typical R/C 10-channel reed receiver along with three servo actuators. Two channels were required for each control function; for example, two for rudder, two for aileron, etc. That's why it took 10 channels to operate rudder, elevator, aileron and throttle.





Far left: the Bramco 10-channel reed transmitter in a hand-held configuration (circa mid-'50s). Immediate left: a typical resonant reed bank as used in an R/C reed receiver. These 8- and 4-channel versions were made by W.S. Deans Co., which later became famous for its line of R/C connectors.

1939

1937
Howard Hughes, flying his H-1, breaks the U.S. transcontinental speed record, averaging 332mph.

Clinton DeSoto won the first R/C Nats with a powered glider.

1938
First one-piece crankcase to cylinder head.

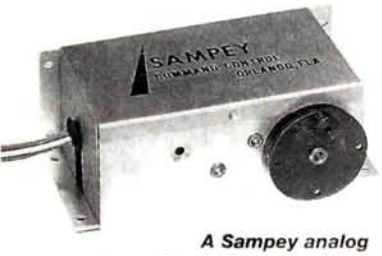
Three-views of the first electric-powered model (it used an electric car horn for power) were published.

Walt Good won the R/C Nats with the Big Guff.

1939
This Bantam .19 (disassembled) was the first production engine to have rear rotary-disk induction. The rotary disk is turned by a pin at the rear of the crank throw.

Germany invades Poland: WW II begins in Europe.

Television debuts in America at the New York World's Fair.



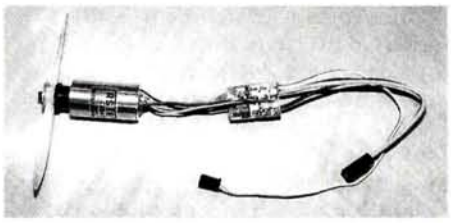
A Sampey analog proportional R/C servo. This is one of the first, true proportional-control devices that took the place of the full-control-only that was all you could obtain from the old reed and escapement actuators.

used a War-surplus Emerson 24V motor along with 25 silver/zinc battery cells. From that start, also in 1957, Fred Militky developed the first production kit of an electric-powered free-flight design, the Silentius, for the Graupner company. In its infancy, electric power was frowned upon by many modelers because the batteries weighed down the model too much, and the resulting flights were brief.

In the late '70s, several small ARF electric R/C models manufactured by the Kyosho company of Japan made the scene. These models used 3-channel control of rudder, elevator and motor throttle (via an electronic motor speed controller). Battery packs that had 7 Ni-Cd cells and used simple, direct-drive motors were able to support 5-minute flights.

Above left: a departure from the complicated R/C systems of the day. This Ace single-channel pulse proportional control system employed a magnetic Adams actuator. Neutral rudder was achieved by pulsing the control equally in both directions. The pulse rate was either shortened or lengthened to achieve different degrees of right and left rudder. Above right: one of the many digital proportional R/C systems introduced in the mid- to late '70s. This Pro-Line system was eventually taken over by Ace R/C before it was finally phased out.

As we progressed into the '80s, modelers got smarter and went to gear- and belt-reduction drives, which allowed the use of larger prop diameters with a corresponding reduction in total current. What we ended up with was more thrust with less current drain and, as a result, longer flight times. That philosophy has carried over into the present, but the entire electric power industry has been constantly improving its products. We now enjoy the higher efficiency brushless DC motors, and we have seen many improvements in battery technology in recent years. The result has been a reduction in total weight with increases in flight time. It is now easy to demonstrate a ¼-scale Cub flying with electric power at close to 15 pounds, operating from an inexpensive drill motor with a belt-reduction drive and 32 battery cells. As described, this model can put in 10-minute flights and be recharged and ready to fly again in just 20 minutes.

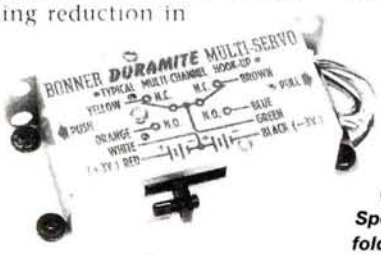


AstroFlight's new brushless 020 motor and companion speed control. Brushless motors offer higher efficiency and longer service life.

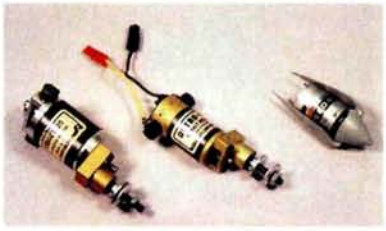
The day and age of electric power is upon us. Many advantages can be found, such as the lack of noise and pollutants, the ability to fly multi-motor models off the same battery so that one motor never dies, and the fact that fuelproof paints are not necessary. Put those all together, and you have a user-friendly power system that always starts up on the first flip of a switch, regardless of the temperature or the weather.

Parallels have been drawn over the years from the Wright Brothers in aviation to the space shuttle, and from the Good brothers in modeling to the inexpensive, reliable and extremely sophisticated R/C systems of today. To that, we can add all the features and benefits of clean and quiet electric-powered flight. The past and closing century was certainly good to the aviation modelers of the world; it makes you wonder what kind of progress we'll see in the next!

The Hitec Spectra synthesized RF transmitter modules allowed you to tune in all 50 R/C aircraft channels on the 72 to 73MHz band.



The Bonner Duramite servo was one of the first of the digital proportional R/C servos. It was part of Bonner's Digimite 4RS system. This was a linear rather than a rotary output-type unit. The only problem was that control throw was minimal.



Some of the more common electric motors seen at flying fields today: AstroFlight 40 geared cobalt motor (left), AstroFlight geared 05 (center) and Graupner Speed 400 direct-drive with folding prop blade attached.

1940

1940
First production engine fitted with two ball bearings on the crankshaft.

First engine to use rear rotary-drum-valve induction.

The Perky .19 was first to use first-type Schnuerle porting featuring exhaust stacks on both sides of the cylinder.

Feeney 4-stroke engines were the first produced for modelers before WW II. Three sizes were available.

1941
Japanese attack Pearl Harbor.

Regular TV broadcasting begins in the U.S.

First jet airplane takes flight.

1944
D-Day.

1946
Dyna-Jet: a real pulse jet for models!

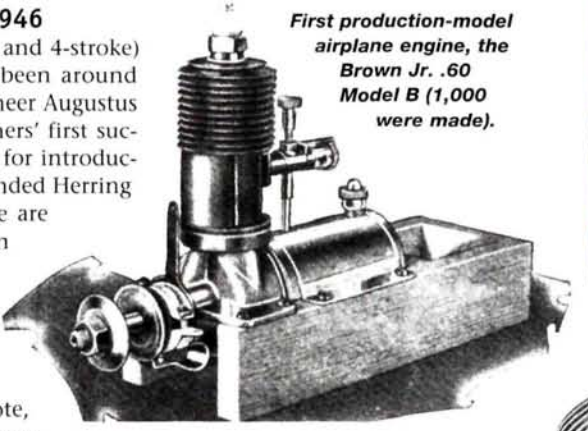
Arden .099 was the first engine to use 360° radial porting on the exhaust.

ENGINES

by Dave Gierke

SPARK-IGNITION ERA: 1932 TO 1946

Tiny internal-combustion engines (both 2-stroke and 4-stroke) that are capable of flying a model plane have been around since the beginning of the century. Aviation pioneer Augustus Herring made one shortly after the Wright brothers' first successful flights. A teenage Ray Arden (later famed for introducing the glow plug and tiny 2-stroke engines) hounded Herring until he shared his technical information. There are many tales of "one-off" engines having flown models throughout the early 1900s. It wasn't until the early '30s that an innovative school teacher from Pennsylvania perfected an engine that would be mass-produced for the general modeling public.



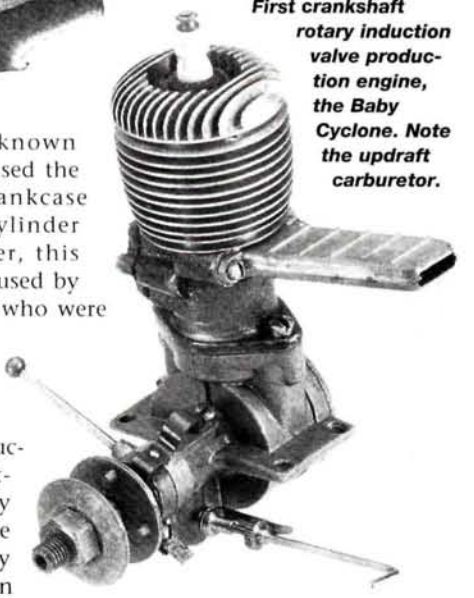
First production-model airplane engine, the Brown Jr. .60 Model B (1,000 were made).

In the 1937 "Flying Aces," Phil Zecchitella wrote, "Plans for a practical miniature engine for use on model planes were first developed in 1929 by Bill Brown Jr., but it wasn't until a year later that he succeeded in constructing a motor that would cough two or three times." A persistent Brown built three experimental engines in 1931. In 1932, he made the Model A, which had a displacement of 0.601ci and had a sand-cast crankcase and rear cover, a lapped steel piston (no ring), steel connecting rod and crankshaft. It used side-port, piston-controlled induction, cross-flow scavenging and a spring-steel mechanical-ignition-timer frame. The engine borrowed heavily from motorcycle technology, but why not? It worked!

In 1934, 1,000 Model B Brown Junior .60s became the first mass-produced model engines and sold for $21.50—a hefty bill for the Depression years. The Model B was similar to the Model A but had a die-cast crankcase and rear cover and a straight intake tube with air-choke nut. Many young modelers, mesmerized by Charles Lindbergh, scrimped and saved their pennies until they could afford a real gas engine.

This Forster .305 is an excellent example of how manufacturers began to cast crankcases to above the exhaust stack.

Also in 1932, Mel Anderson had designed and built a prototype engine that featured a crankshaft rotary-valve-induction system. Some of its features turned up a few years later in the Baby Cyclone .36 X, the first design of the prolific Bill Atwood. Assisted by Anderson, Atwood produced this highly successful engine, which sold 15,000 units between 1935 and 1939. The engine's primary advantage was its asymmetrical timing (the induction valve could open and close at the discretion of the designer).



First crankshaft rotary induction valve production engine, the Baby Cyclone. Note the updraft carburetor.

In 1938, the little-known Morton Challenger used the first one-piece crankcase extending to the cylinder head. A decade later, this technique would be used by other manufacturers who were looking to cut production costs.

In '39, Ben Shereshaw's Bantam .19 was the first production engine to be fitted with a rear rotary disk valve. Like the crankshaft rotary valve, disk induction offered advantages related to asymmetrical timing, but without weakening the crankshaft. This was especially important for racing engines that required a large, radially timed port.

In 1940, the Elf .097 single-cylinder engine was the first production unit to be fitted with two crankshaft ball bearings. That same year, rear rotary drum valve induction was introduced in the Atwood Blue Crown Champion .603. The drum valve was used with a crankshaft front rotary unit to produce very high performance. Today, proponents of the drum valve claim that it's superior to the disk because it can't "flutter" and offers advantages regarding port area.

Because of the War effort, we didn't see significant changes for years, but after WW II, the first pulse-jet engine was sold to the modeling public. Producing over 135dB at 9 feet, the Dyna Jet was used almost exclusively for control-line (CL) speed competition. The engine is still produced and flown today.

At the same time, Ray Arden introduced his .099 and .19

1947

The glow plug is advertised in the November 1947 issue of *Model Airplane News*.

The 2-speed spark-ignition system is introduced.

Methyl alcohol becomes a popular spark-ignition fuel.

Chuck Yeager breaks the sound barrier flying a Bell X-1.

1948

The K&B Infant .020 was the first mass-produced ½A engine.

First muffler for model engines is marketed.

Fox .35 stunt.

Early production fuel tanks by Froom.

Scientists at Bell Labs invent the transistor.

1949

1949

Pen-bladder fuel tank and delivery system.

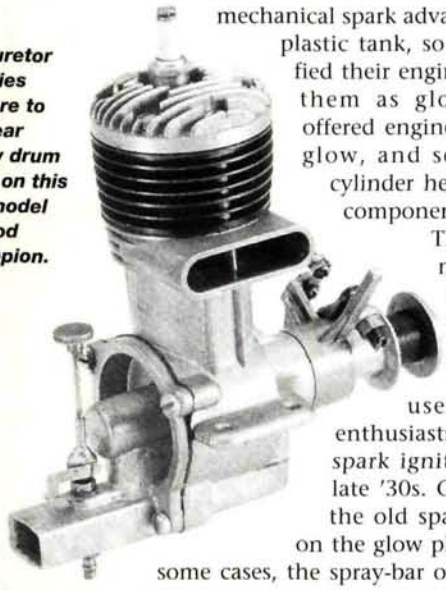
Synthetic lubricants used in model engines.

engines, which each featured three exhaust ports covering the cylinder's entire circumference. First appearing in a '30s German D.K.W. motorcycle engine, radial porting would become the dominant scavenging system used with the new "baby engines."

EARLY GLOW ERA: 1947 TO 1962

A prime mover in the field, Arden introduced the glow plug in 1947, distributing plugs at that year's Nats to anyone who would try them. The first magazine ads appeared in the October modeling magazines, and the rush toward change was on! This wasn't welcomed by all factions, and many engine manufacturers were forced to close their doors because their products wouldn't perform well with the new, simpler glow plug. Manufacturers of accessories (spark plugs, ignition coils, etc.) were outraged by the paradigm shift. Advantages and disadvantages of the old and new systems were rehashed in the magazines and advertising, but it didn't take long for modelers to make up their minds: the glow plug was an instant hit!

Engine companies were caught with large inventories of sparkers on hand. Glow models eliminated the mechanical spark advance mechanism and plastic tank, so most simply modified their engines slightly and sold them as glow models. Many offered engines as either spark or glow, and some modified the cylinder head and other minor components.



Carburetor supplies mixture to the rear rotary drum valve on this late model Atwood Champion.

The old standby fuel, mixed gasoline and oil, didn't work well with the glow plug. Methyl-alcohol (methanol) was first used by tether-car enthusiasts in their miniature spark ignition engines in the late '30s. Conversely, many of the old sparkers wouldn't run on the glow plug and new fuel. In some cases, the spray-bar orifice was too small. Others required the compression ratio to be increased. Designs such as the Ohlsson couldn't handle the increased cylinder pressures and blew their staked-on steel cylinder assemblies off their aluminum-alloy crankcases.

Howie and Heuier of Norristown, PA, developed the platinum-alloy wire ignition system. Their "hot coil"-equipped engine was working well by the mid-'30s, but they were prevented from marketing it during WW II. When they finally advertised the H&H engine in 1947, it was ignored by most modelers who didn't understand its platinum-wire ignition and rejected its old-fashioned, side-port induction with Brown Jr.-style screw-in cylinder. At $24.50, the H&H was also expensive.

Feeney 4-stroke engines were the first produced for modelers before WW II. Three sizes were available.

In 1947, Forster introduced its 2-speed ignition system that allowed rpm to be reduced by electrically (remotely) switching from one set of contacts to the other. Although most sparkers were doomed to extinction within a few years, the Forster .99 remained popular into the next decade with R/C experimenters who appreciated the .99's torque and "throttle-ability."

A strange but intermediate step between the spark plug and glow plug appeared in 1947. Known as "ignitionless" operation, it allowed high-compression engines to continue running after the spark-ignition system had been shut off! By using a special "hot" fuel called Liquid Dynamite, experimenter Ed Chamberlain developed a system in which the coil, condenser and batteries were used only for starting and warmup. The spark plug and timer points were retained by the engine as the plug elements became incandescent; this continued the ignition process. It was rumored that Liquid Dynamite contained a nitro paraffin such as

Dyna-Jet: a real pulse jet for models!

1950

1950
Start of Korean War.

Early '50s
First R/C channel on part of the citizens band (27.255MHz).

Bonner compound escapement.

1952
Reed-valve induction for ½As.

Rotary barrel throttle.

Jim Walker's throttle-control flapper valve and exhaust butterfly were pneumatically actuated.

Two needle valves for 2-speed throttle operation developed by K&B and Bonner.

1953
Temperature-controlled clearance (TCC) for pistons/cylinders.

Structure of DNA discovered.

Dr. Jonas Salk's vaccine for polio is proven effective.

Plans for Miller and Lorenz receivers published in *Model Airplane News*.

1954
First muffler offered as an accessory in America; the kit cost $2.98.

***The glow plug is advertised in the November 1947 issue of* Model Airplane News.**

nitromethane or nitropropane.

On the heels of the revolution caused by his glow plug, Arden unveiled his Formula B "hot" contest fuel containing over 35 percent nitromethane (then a little-known additive). Nitromethane liberates oxygen during combustion and greatly increases the performance of many engines. The Dooling brothers reported a 32-percent power increase with their .61 racing engine when using the Arden formula instead of regular methanol and castor oil. From 1947 on, methanol, nitromethane and castor oil became the basic ingredients of almost all model engine fuels in the U.S. Soon, there were glow fuels with exotic names: Blue Blazer, Hell Razor, Nitro-X, Power Mist, Red Devil, Sky Ranger, Super Atomic and Spitfire Racing.

The acceptance of the glow plug stimulated designers to produce an entirely new line of "baby" engines. Later called ½As, these first units used the popular crankshaft rotary induction method. K&B Mfg. was the first to market a mass-produced ½A engine. Their Infant Torpedo .020ci was about ⅕ the cylinder displacement of the smallest Class A engine. Soon afterward, Anderson introduced the Spitfire .045, and Herkimer offered the O.K. Cub .049 with a displacement that eventually became the standard for ½A engines. All three were successful from a technical and financial perspective.

The first commercially available muffler for 2-stroke model engines, the Mart-Lee Muffler, was introduced in 1948 by Californian Marty Johannes. The unit was essentially a long, hollow tube filled with steel wool. That same year, Duke Fox began selling his revolutionary Fox .35 stunt engine by mail. Still produced today, the one-piece crankcase, drop-in steel-liner classic was designed specifically for the glow plug. Its success spurred other manufacturers to follow Duke's lead in downsizing from popular prewar .60s to engines with more manageable displacements that could be used with smaller models. With the "baby boom" under way, there was now room for family members in daddy's car when traveling to flying fields!

To keep pace with the hot new glow fuels, speed flier Bill Wisniewski introduced the pen-bladder fuel tank in 1949. His combination tank and pressure delivery system allowed engines with large-bore venturis to acquire the correct amount of fuel without relying on their reduced fuel-draw capability. Dooling introduced the non-metallic plastic rear rotary disk valve on his superb racing .29 that same year. This system used plastic and aluminum, which eliminated the tendency to seize when similar materials rubbed together.

The problems of scuffing and seizing associated with metallic disk valves were partially solved by McCoy when a chrome-plated aluminum disk face was used with a hardened, full-diameter steel shim. These innovations were used in the McCoy Series 20 glow .60 of 1949.

One of the difficulties associated with using nitromethane in fuel beyond proportions of approximately 45 percent is its inability to mix with castor oil. As greater nitro percentages were desired by speed fliers, a stabilizer such as nitrobenzene (today identified as a carcinogen) had to be introduced, or you needed to replace all or part of the castor oil with a polyoxide synthetic "Ucon" oil. These Union Carbide lubricants were originally formulated for the relatively new gas-turbine, thrust-reaction engines. In '49, Ucon LB-525 and LB-625 were being used in some high-nitro, glow-fuel blends.

In 1952, Leroy Cox marketed his Space Bug .049 with its

Early production fuel tanks by Froom.

1959

1955
Bramco introduced the first aftermarket rotary barrel throttle.

1956
First aftermarket exhaust throttle: the Roto-Valve.

1957
Soviets launch Sputnik 1, the first artificial satellite, and the space race begins.

The first electric-powered R/C model flight.

Graupner sells the Silentius—the first electric-powered model airplane kit.

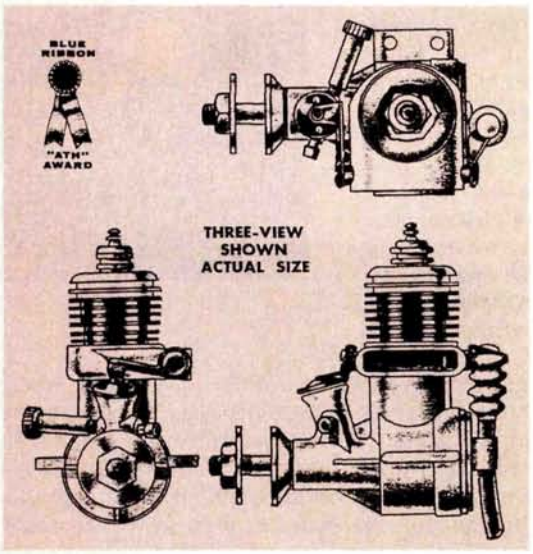
Quadraplex introduces the first commercially available, proportionally controllable, reliable R/C system.

1958
Veco's Hi-Lo engine line featured exhaust and throttle-barrel throttling.

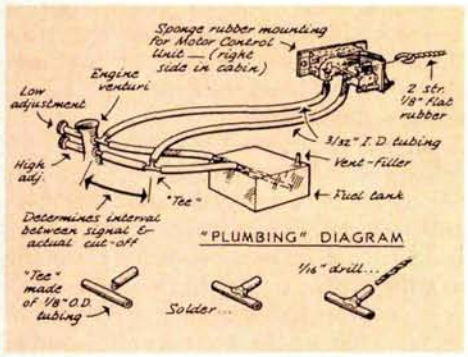
Veco advertised the first polyethylene clunk tank—$1.20 for a 4-ounce unit!

Late '50s
Five more R/C channels added on 27MHz frequency.

Resonant reed multi-channel R/C systems developed.



Left (top): Jim Walker's throttle-control flapper valve and exhaust butterfly were pneumatically actuated. Left (below): two needle valves for 3-speed throttle operation developed by K&B and Bonner.



distinctive reed-valve induction system. The most important advantage of the reed valve, when compared to conventional types like the disk and crankshaft rotary, is its ability to open and close according to the demands of the engine. Manufacturers learned early that in very small engines, a hardened-steel piston and cylinder maintain their shape and fit for long periods. Cox was able to produce these consistently to 25 millionth inch. You could order a new piston from Cox without sending your cylinder, because all the pistons fit!

Also in '52, Jim Walker introduced his Firecracker .065 glow engine equipped with a throttle for CL flying. Throttling was obtained through the combined action of a flapper valve on the venturi and a butterfly valve in the exhaust stack. Using a pneumatic (air) actuator to open and close the throttle through a squeeze bulb at the control handle, the engine realized a fully proportional speed range.

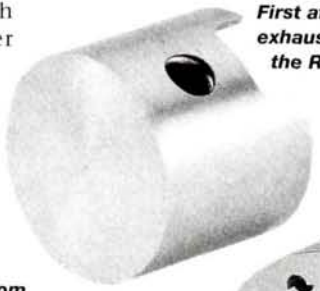
Never known to sit idly by, the prolific Jim Walker also invented the regulated pressure tank in '52. A latex tank was sandwiched between pieces of plywood with rubber bands wrapped tightly about the assembly; a pressure regulator sensed the difference between atmospheric pressure and the negative pressure (pressure drop) at the engine's venturi. Pressure differential actuated the regulator's diaphragm and fuel-flow control valve. Besides providing the correct fuel mixture to the engine under varying operating conditions, the tank eliminated fuel foaming because it didn't contain any air. Today, Walker's pressure regulator concept is used in several high-profile fuel-delivery systems.

Continuing 1952's banner year for innovation, Mills Engines of Great Britain offered a new, rotary barrel carburetor as an accessory for its .045 diesel and as standard equipment for the .08 diesel. Although it only throttled air induction, the mechanism would soon be heard from again.

Howard Bonner of California developed the 2-speed throttle control, and John Brodbeck Sr. of K&B incorporated it into his 1952 2-speed Torpedo .19. When they used it with Bonner's rubber-band-powered escapement, early R/C experimenters had limited speed control of their glow engines. The system allowed the engine to slow to about 4,500rpm, 4-cycling enough to stop the model's ascent. Two needle valves on the engine are actuated by air vents, allowing air rather than fuel to reach the needle valve. One valve is adjusted for high speed, the other for low.

First aftermarket exhaust throttle: the Roto-Valve.

In 1953, Veco (Henry Engineering Co.) discovered



Laminar-flow cylinder porting allowed SuperTigre pistons to eliminate the baffle from their crowns.

This SuperTigre G40 cylinder head illustrates the squish-band configuration that was allowed because of flat-top, baffle-less pistons.

1960

1960

Laminar-flow cylinder porting allowed SuperTigre pistons to eliminate the baffle from their crowns.

First flat-top, baffle-less piston.

The SuperTigre G40 cylinder head uses the squish-band configuration that was possible because of flat-top, baffle-less pistons.

The SuperTigre G20-15 featured exhaust and transfer ports that opened simultaneously.

American scientists patent the computer chip.

Early '60s

First analog proportional-control R/C systems developed.

Rechargeable Ni-Cd batteries start to be used by modelers.

1961

The first true fuel-mixture-control carburetor.

Johnson Auto Pitch propeller.

Chrome-plated steel piston, K&B Series Torp .15R.

Fox had the first .40ci engine.

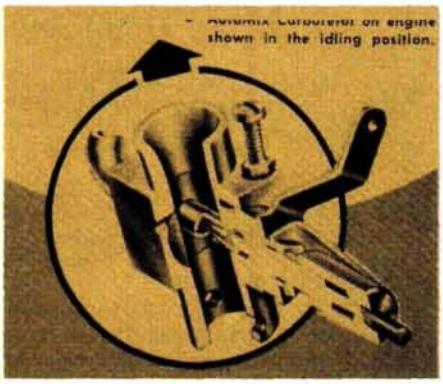
K&B introduces the idle-bar glow plug.

Russian Yuri Gagarin is the first man in space.

1962

Clarence Lee's Veco .45 R/C design. Note the enlarged front of the crankcase, which handles the twin ball bearings—the first of its kind.

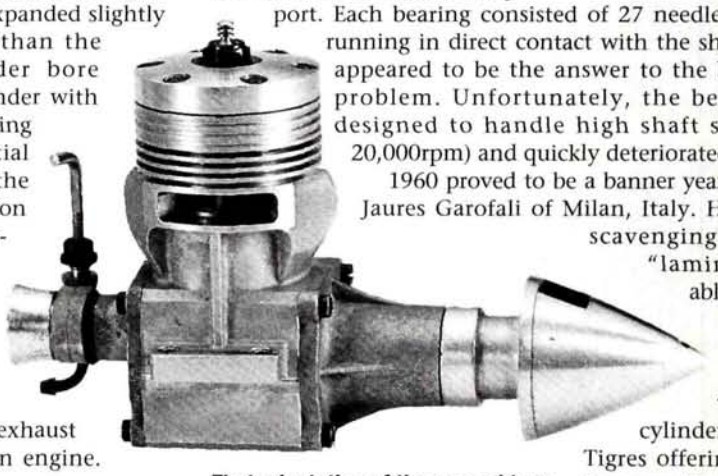
John Glenn becomes the first American to orbit the earth.



The first true fuel-mixture control carburetor.

something so significant about its engine's metallurgy that it became the company's trademark: temperature-controlled clearance (TCC). When the cylinder-head temperature of the lapped engine reached 425 degrees Fahrenheit, the piston expanded slightly more than the cylinder bore did, and it seized. This design used a steel cylinder with integrally machined fins that engineers, including Clarence Lee, decided limited the circumferential expansion of the bore. After machining away the fins, they found that the cylinder bore and piston clearance remained identical from room temperature to 425 degrees F. Thereafter, Veco engines were fitted with a flanged drop-in-style sleeve, which was slip-fit into a separate, finned, aluminum jacket. Smaller clearances resulted in better compression, easier starting and longer life.

In 1958, Veco also marketed the first coupled exhaust baffle and rotary-barrel throttle for a production engine.



First adaptation of the second type of Schnuerle porting was on the "WART" .29.

Known as HI/LO engines, the system was incorporated on the .19 and .35. As discovered by Jim Walker in '52, increasing the cylinder backpressure was necessary when attempting to throttle air-metering carburetors.

Duke Fox, always the innovator, introduced his square-front-intake Combat Special in 1960. It featured front and rear needle-bearing shaft support. Each bearing consisted of 27 needles in a steel race running in direct contact with the shaft journal. This appeared to be the answer to the bulky front-end problem. Unfortunately, the bearings weren't designed to handle high shaft speeds (of over 20,000rpm) and quickly deteriorated.

1960 proved to be a banner year for SuperTigre's Jaures Garofali of Milan, Italy. His new cylinder scavenging system, called "laminar flow," enabled his engines to use flat-top, baffle-less pistons and a true squish-band cylinder head. The first Tigres offering these revolutionary features also had simultaneously opening transfer and exhaust ports! While skeptics loudly disapproved, the little G20-15 Jubilee speed engine performed admirably, setting several CL speed records as soon as it became available to competition modelers.

In 1967, Hi Johnson of Dynamic Models Inc. marketed a product that could arguably be the single most important breakthrough in the field of engine throttling: the Auto Mix carburetor. This device combined the positive features of the air-metering throttle- barrel carburetor with proportional fuel metering. Regrettably, modelers found the Auto Mix carburetor inconvenient, and many preferred to struggle with the inferior air-bleed systems.

In '62, Veco released the Clarence Lee-designed front rotary-induction .45 R/C, which featured twin ball bearings for crankshaft support without creating a massive front crankcase. Clarence's clever compromise of bearing sizes, crankshaft axial bore dimensions and crankcase design paved the way for the future.

Continued on page 40

1963
President John F. Kennedy assassinated.

Chrome-plated steel cylinders used with ringed-aluminum pistons.

1964
First adaptation of the second type of Schnuerle porting was on the "WART" .29.

The Beatles take America by storm.

1965
Tuned pipes introduced.

1966
Dykes-type piston ring.

First American model engine marketed with a muffler was the Cox QZ .049.

Top Flite introduces MonoKote covering film (in six, high-gloss colors: white, red, aluminum, yellow, black and orange).

1967
The two-needle mixture control carburetor.

Flow-through mufflers.

1968
The HP .61 R/C from Austria was the first production engine that incorporated Schnuerle porting.

First ABC production engine.

The E.D. Power Pipe was the first production tuned pipe.

M. Meyer offered the cork-stopper tank.

1969

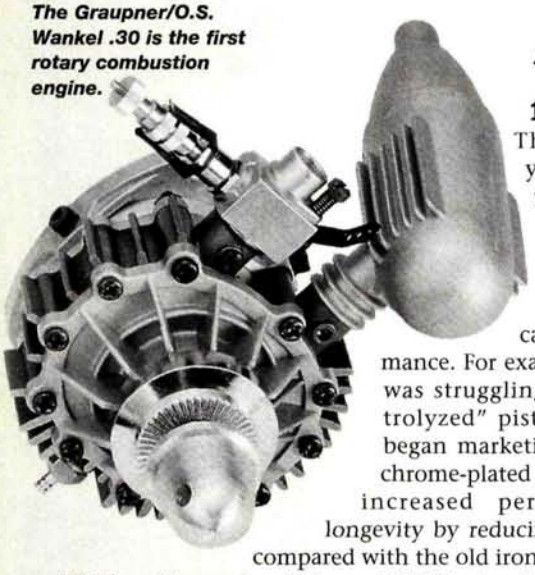
1969
Diaphragm fuel-delivery pump.

Apollo II makes the first manned lunar landing.

Late '60s
Modern-day digital-proportional control developed.

FCC grants seven channels on a new band using frequencies on 72 and 75MHz.

Continued from page 37



The Graupner/O.S. Wankel .30 is the first rotary combustion engine.

ADVANCED GLOW ERA: 1963 TO 1969

The next seven years were characterized by unprecedented advances in engine design, materials application and performance. For example, while K&B was struggling with its "electrolyzed" pistons, SuperTigre began marketing engines with chrome-plated steel liners; these increased performance and longevity by reducing friction when compared with the old iron and steel units.

K&B's cutting- edge designer, Bill Wisniewski, produced several Schnuerle-ported prototype engines in 1964. Known as the "Warts" because of three crankcase protrusions that housed bypass channels, they proceeded to set national records in the .15, .29 and .60 classes of CL speed. K&B decided not to produce the Schnuerle-port engines, however; this honor would be left to Hirtenberger.

In '65, Wisniewski introduced another earth-shattering development in model-engine power: the tuned expansion chamber (tuned pipe). Today, tuned pipes are standard equipment for 2-stroke R/C pattern engines and FAI CL speed models.

The low-tension piston ring (Dykes type) was developed in 1966 by Jim Nightingale while he was at K&B. Sometimes called an L-ring, the unit resides in a special groove at the top of the piston and is acted on by combustion gases. It reduces friction losses associated with more conventional compression rings, thus increasing engine power and efficiency when operating correctly. The first production engine to use this ring was the Series 66 Torpedo .40.

In 1967, Webra of Austria marketed its 2-needle (TN) carburetor, which improved upon the Dynamic Auto Mix unit. The TN regulates fuel admission by using a second needle valve that gives a full range of adjustment instead of substituting one needle for another with a different taper. Most modern fuel-metering carburetors are based on the TN.

The first mass-produced Schnuerle-ported model airplane engine was marketed by the Austrian manufacturer Hirtenberger (HP) in 1968. Paul Bugl's revolutionary design (.61 CL and R/C) was the hit of the season but unfortunately suffered from terminal production flaws. More important, the concept had been established.

With the help of American metallurgist and CL speed modeler Dick Hall, SuperTigre again raised the performance level of miniature engines with the release of the first ABC engine, the S.T. G60R, in 1968. Lapped ABC configurations (aluminum piston, brass chromed liner) expanded more uniformly throughout an engine's operating temperature range. Matched expansion reduced wear and the possibility of catastrophic failure experienced by earlier metallurgies. ABC pistons and cylinders are the norm rather than the exception for engines today.

The Perry carburetor was introduced in 1969. By incorporating a unique metering system and built-in fuel reservoir, the Perry could draw the proper amount of fuel at any throttle setting. Today, the Perry carburetor is marketed by Varsane.

The first diaphragm fuel delivery pump was sold in 1969 by the KNK company of Japan. Because it didn't incorporate a pressure regulation system, the unit wasn't suitable for use with standard pressure-drop type carburetors. That development would have to wait.

REFINEMENT AND MODERN ERA: 1970 TO THE PRESENT

John Perry hit the jackpot again in 1972 with his mixture-control carburetor that allowed you to adjust the needle valve while flying. An extra servo and radio channel were required to operate the unit.

The Yamada YS-60 pressurized fuel system was first marketed in America in '73. Consisting of a large-bore carburetor and built-in pressure regulator, the system obtained its high pressure from rotary-valve-timed crankcase pressure. YS uses a similar system today.

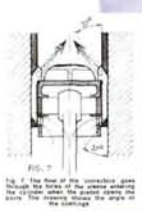
In '74, Bob Violett and Jim Scozzafava teamed up to produce the first commercially available ducted-fan equipment. Jim's fan was coupled with a K&B racing engine, while Bob designed the airframe (Sundowner) and engineered the total package. It was first demonstrated at the International Pylon Racing Championships held at Lakehurst, NJ, and signaled an exciting

Fusite Co. makes the biggest change in glow-plug design since Arden's patent: the GloBee.

1970

1970
The Graupner/O.S. Wankel .30 is the first rotary combustion engine.

I. Magrotti of Italy develops cylinder control ports.



1972
Du-Bro's Universal muffler introduced.

1973
Muffler pressure first described in *Model Airplane News*.

YS pressure regulated fuel system and carburetor.

All-metal fuel filter introduced.

1975
Perry directional porting.

Fusite Co. makes the biggest change in glow-plug design since Arden's patent: the GloBee.

Perry pump and regulator.

1976
The O.S. FS .60 was the first of the modern 4-stroke production engines.

First of modern 4-stroke radial production engines.

Quadra 35cc signaled the start of the giant-scale movement.

Diesel-head conversion created by Davis Development.

The original Technopower radial 4-stroke engine was loved by scale modelers everywhere.

new development in model aviation.

Perry directional porting (PDP) was first adapted to a commercially available engine in 1975. Similar to Magrotti's control ports of 1970, Perry's patented system was intended for engines outfitted with old-style, baffle-top pistons and, for a while, the modification kept these long-in-the-tooth designs competitive with modern Schnuerle-ported engines. That same year, Perry's pump regulator was fit into a special backplate of the Series 75 K&B 61. Like the YS unit before it, fuel-tank position within the model was no longer critical.

Before 1976, all 4-stroke engines had been fitted with spark-ignition units. It was widely believed that the glow plug would cool off too quickly during the engine's exhaust and induction strokes. However, preproduction prototypes proved to O.S. engineers that this wasn't the case. Achieving widespread acceptance in Japan, the O.S. FS-60 engine was promptly exported to America. Operating on ordinary 2-stroke fuel and glow plugs, the new engine was remarkably quiet, but it produced only 40 percent of the power expected from an equivalent-size 2-stroke engine. No matter; sport fliers loved the quiet, relaxing, Sunday-afternoon sport engine because it was ideally suited to slower models.

In '77, Enya released its .60XF-TV engine. The most interesting feature was its chromed aluminum-alloy cylinder sleeve. When fitted with a lapped aluminum-alloy piston with 20 percent silicon, it expanded very similarly to the sleeve, thus acting very much like an ABC unit first used by SuperTigre. Additionally, it weighed less. This feature has been seriously considered by designers of modern high-performance racing engines.

Du-Bro offered the first of the modern geared propeller drive units in 1977. The all-ball-bearing, gear-belt system promised enough torque to turn propellers of up to 24 inches in diameter using a standard .60 engine, so it could fly models of up to 30 pounds. Other manufacturers followed, including Byron, Higley, Webra, O.S., Kress and Stewart.

In 1981, Condor Hobbies released the Australian-manufactured Magic Muffler (Phelan Competition Products) to America. The muffler was about half the length of a conventional diverging/converging tuned pipe but produced a comparable power boost. Originally intended for FAI and low nitromethane fuels, its promoters also raved about its silencing qualities. In modern form, the device produces impressive power gains; however, noise reduction really isn't one of its virtues. Permutations of the Magic Muffler concept may be found on racing engines produced in the U.S. by Jett and Nelson.

Also in '81, O.S. introduced its aluminum piston with brass, nickel-plated (ABN) liner system for pistons and cylinders on the MAX .40 VF engine. The liner is treated inside and out with a non-electrodeposition of very hard, nickel-based composite plating, which is low-friction and hard-wearing. Although chrome has superior longevity, nickel has a much better lubricant plating action.

In '83, we saw a breakthrough in the field of miniature internal combustion engines: the gas-turbine thrust reaction engine commonly known as the jet turbine. Jack Jackman was the first to accomplish an actual flight with a turbine engine at an RAF runway at Greenham Common in England.

It wasn't until five years later that Brian Seegers flew his turbojet engine (S-100), operating on unleaded gasoline, over the Arizona desert. Six years later, the commercially available JPX turbine from France was flown for the first time in competition at Top Gun. Since then, turbines have become increasingly more visible in R/C scale competitions and jet fun-flys.

In 1994, Jim Cline began marketing his Proportional Control Fuel System (PFCS) to modelers wishing to realize more reliable engine operation, without regard to fuel-tank position. The "regulator" functioned well with all engine sizes. Offered for both glow and gasoline fuels, the unit delivered pressurized fuel (crankcase pressure) to the diaphragm regulator, which controlled flow to the carburetor by sensing its pressure condition at the venturi in a manner similar to Walker's regulator 42 years earlier!

Automatic in-flight fuel mixture control for propeller engines was available to modelers in 1998. The Mini Hobby Automix monitors exhaust-gas temperature, invoking a servo system to auto-adjust the mixture control valve if these temperatures increase (lean condition) or decrease (rich condition).

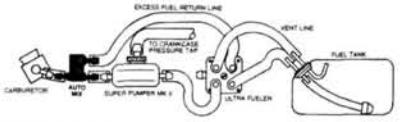
This century has seen significant changes and improvements in model airplane engine design, materials and engineering, and these developments have had a tremendous impact on the types of models that we fly today. It's anyone's guess what innovations we'll see in the next 100 years.

1979

Viking Lander lands on Mars.

Satellite City Hot Stuff cyanoacrylate (CA) glue hits the market.

Robart introduces its in-line pump and control unit: Super Pumper and Auto Mix.

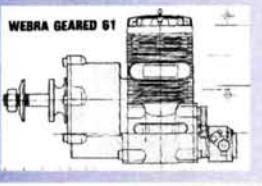


1977
First AAC production engine.

Geared prop-drive unit for large models.

First mass-market personal computers launched.

1979
Webra .61 geared-output shaft engine was the first of the modern production gear-shaft engines.



In-flight variable-pitch propeller.

MODELS

by Nick Ziroli Sr.

There have been many milestones in model design throughout the history of R/C model flying. To choose the most important models—those that had the biggest impact on the hobby—would be a difficult task. I can think of a number of models in many categories that would qualify as "new and important" developments.

The Good Brothers, Walt and Bill, pose with their famous model—the Big Guff.

Choosing models from the early days of R/C is a relatively easy task, since there were so few R/C models around, and just about every successful flight could be considered a milestone. I think the first model that brought R/C to our attention and made us realize what the future of R/C might bring was the Big Guff, built by twin brothers Walt and Bill Good. This 8-foot-wingspan, box-fuselage model was powered by a Brown Jr. engine. Flying the Big Guff, the Good brothers won in the R/C class at the 1938, '39, '40 and '47 Nats. The first R/C Nats was in 1937, and the Goods probably would have won that one also, if circumstances had not prevented them from flying. Clinton DeSoto won that year with a powered glider.

What really makes the Big Guff a milestone is not the model itself. It was a combination of the model, a reliable radio system and the Goods' efforts to demonstrate them for the purpose of obtaining dedicated, hobby-related radio frequencies. If not for the Good brothers, we would not have received our first radio channel (27.225MHz) as soon as we did: March 1952. It is good to know that historians have acknowledged the importance of the Big Guff and have given it a place in the Smithsonian's Air and Space Museum in Washington, D.C. (A replica of the Big Guff hangs in the AMA Museum in Muncie, IN.)

In the 1940s and early 1950s, most R/C models were no more than controlled, free-flight models, and we could fly only one model at a time on our single radio channel. Generally, the only control was a sequenced rudder (right, neutral, left, neutral, etc.) controlled via a push-button on the transmitter. Throttle control (when it was used) was obtained with dual ignition points. Remember, the glow plug didn't come along until 1947.

Again, Walt Good produced the second model I would consider a milestone; it was called the Rudder Bug, and it was featured in the May and June 1949 issues of *Model Airplane News*. The Rudder Bug was one of the few R/C models at that time that was designed specifically for R/C. It had a 74-inch wingspan, tricycle landing gear and was powered by a .30ci engine; control was via rudder and throttle. It was a popular model then, and it's still popular today with Vintage R/C Society members. Its success prompted Berkley Models to kit a 62-inch-span version—the Royal Rudder Bug.

Typical of the times, this 1950s photo speaks of a simpler time in RC. The hand-held control unit is not much different in size from today's computer radios, but reeds and tubes were king.

Two more designs that should be considere milestones are Harold deBolt's Live Wire Trainer and Lou Andrews' Trixter Beam. I believe the Live Wire was the first R/C kit to be produced in quantity, and the Beam followed shortly after as a Guillow's kit. Around 1952, I built a Live Wire when the deBolt Model Engineering Co. (DMECO) kit first came out; with an O.K. Cub 14 engine and a Berkley Aerotrol single-channel radio system, it actually made some successful flights. Both models were similar in size (about a 48-inch span), and both had functional, deep-bodied fuselages. Aesthetically, I think the Beam was

1980

1981
ABN piston and cylinder system.

Space shuttle Columbia—the first reusable spacecraft—is sent into space.

1982
Perry micro-oscillating fuel pump.

1983
First turbine flight (Great Britain).

FCC grants 50 additional R/C channels for R/C aircraft and 30 more channels for cars and boats.

Dave Brown led the way in R/C computer flight simulators.

1984

the more attractive of the two models; however, beauty is in the eye of the beholder. I'll never forget seeing Lou Andrews fly his Beam in extremely high winds at a meet sponsored by *The New York Mirror*; he made it look so easy!

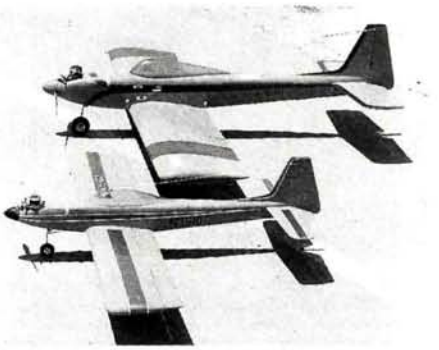
By the mid-'50s, audio-tone Reed systems were becoming popular. These made full use of non-proportional control for all surfaces and throttle. In competition, Alex Schnieder's revised Capital Cub controlled by an Ed Rockwood's 5-channel Reed system became the plane to beat. He won the 1952, '54 and '55 AMA Nationals. The success of Reed systems brought about the development of the modern pattern aircraft we fly today.

Above (top): one of the successful Carl Goldberg Models Falcon trainer series, a ½A-powered Jr. Falcon is sent aloft. Above (bottom): Len Purdy looks over some early Lanier RC ARF inventory. In the mid '50s and early '60s, Len produced the successful line of foam and plastic models.

Another milestone design was Howard Bonner's high-wing, aileron-equipped cabin model, the Smog Hog. The use of ailerons was not common at that time, but their advantages were soon evident and it wasn't long before most models had them. Bob Dunham's 1957 Astro Hog was one model that made the best use of them; it was the first truly aerobatic competition model. The Astro Hog design took the top four places at the 1958 AMA Nationals. Plans for it were published in *Model Airplane News*, and Berkley Models first produced an Astro Hog kit; a modernized version of it is available today from Sig Mfg.

The next generation of aerobatic models that won at the 1962 AMA Nationals and remained popular for many years was Ed Kazmirski's Taurus. This was still in the era of Reed systems, and the Taurus was designed to make the most of the system's limitations (non-proportional control). The Taurus had a rather long tail-moment and a very thick (22 percent) wing. The long tail smoothed out the pilot's "pulsed" control inputs. Diving speeds were kept down by the drag of the thick wing. The Taurus was one of the first popular models to make use of strip ailerons. It was also published in the January 1963 issue of *Model Airplane News* and kitted by Top Flite Models.

The last pattern model I would consider a milestone is Phil Kraft's designed-for-proportional-control Kwik-Fli. It won many times at the World Championships and the AMA Nationals. A construction article was featured in *Model Airplane News* (February 1968), and later, Top Flite Models kitted it.



Featured in the February 1968 issue of* Model Airplane News, *Phil Kraft's Kwik-Fli won many world championships and national competitions.

From the late 1960s to today, few true milestone aircraft have come about. Radio systems allowed us to duplicate any control of a full-size aircraft, and model designs developed and improved each year. Art Schroeder's Eye Ball (August 1969 issue), Norm Page's Mach One (June '73 issue) and Dave Brown's fine Phoenix series of pattern aircraft were all part of this more recent development.

Very popular in the late '60s and early '70s, Lou Andrews' Aeromaster biplane was manufactured under Lou's company name, AMCO.

1984

1984
First V-twin 4-stroke engine.

Futaba 8SGA radio released, first with PCM technology.

1985
A preassembled, "ready for takeoff," R/C helicopter called "the Shuttle" arrives in the U.S.

1986
The first round-the-world flight without refueling made by Dick Rutan and Jeana Yeager flying the Voyager.

1989

1988
The first Top Gun Scale Invitational

The first jet-turbine flight in the U.S.

Clinton DeSoto won the first R/C Nationals with a powered glider.

Today, scale aerobatics seem to be in favor, and the popularity of the Tournament of Champ-ions (TOC) and International Miniature Aerobatic Club (IMAC) events are obvious. TOC models have developed into very large (40-percent and larger) scale aerobatic aircraft; wingspans on the order of 12 feet and engines of 15ci displacement are not uncommon.

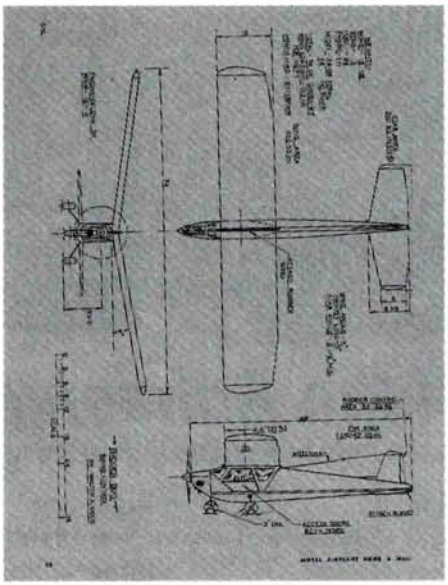
GIANT SCALE

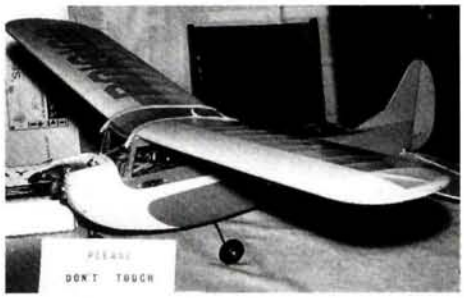
Model development also brings us to giant scale. I can't think of any real milestone in giant scale. My 93-inch-span Corsair and Bud Nosen's 100-inch-span P-51 both appeared about 1978 and might be considered important to the warbird activities that are so popular now. The Quadra 35 was the first really successful gasoline engine for giant-scale models. Recognition should go to the man and organization that made giant scale what it is today: Don Godfrey and the International Miniature Aircraft Association (IMAA). The IMAA has unified rules for operating giant-scale models worldwide and has popularized the "no contest," fun-fly movement. Today, non-competition fun-flys are among the most popular events.

SCALE COMPETITION

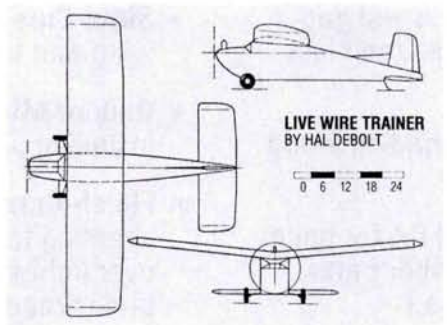
Today, almost all competition scale models are IMAA-legal (80-inch wingspan for monoplanes and 60-inch for biplanes). Beautifully rendered scale models have always been flown in competitions, but the poor reliability of radios and engines in the past often cut their careers short. It also seemed that the most proficient builders were the least proficient pilots. Today, scale models perform successfully for many years, and scale competitions such as Top Gun place limits on how many times a particular model can compete; this is known as "the three-year rule." It ensures the participation of new models every year.

Scale modeling has developed over the years, and the models keep getting better and better every flying season. There is, however, one model in particular that I would consider a milestone. The model that "raised the bar" a bunch of notches was Dave Platt's SBD Dauntless at the 1968 AMA Nationals. This was the first time at any Nats that rivets, panel lines and retracts had appeared on a scale competition model. Furthermore, the static judges could find no fault with it and, for the first time ever, awarded a model a perfect 100 points. Dave's Dauntless set a standard that modelers have learned to duplicate. If you ever consider serious scale competition, be prepared to learn many new skills and techniques.





Above: the Trixter Beam designed by Lou Andrews. Lou flew it in the 1950s at Mirror meets in New York City.
Left: 3-views of Lou Andrews' Trixter Beam. Below left: Hal deBolt's Live Wire trainer (Dmeco kit) was the first R/C plane to be produced in quantity.



OTHER STANDOUTS

In the important area of trainers, one milestone series of aircraft stands out in my mind. Carl Goldberg's Falcon 56 and the Sr. Falcon kits were two of the first really good R/C trainers. Introduced around 1962, the Falcons became two of the most popular kits of the '60s. They taught many modelers to build and fly. Today, for beginners, not much emphasis is placed on building skills. Many of today's popular trainers come built, covered and ready to install the engine and radio system. Actually, many good flight trainers are available at very affordable prices.

My vote for sport model would be Lou Andrews' Aeromaster. His company, AMCO,

1990

1990
The Berlin Wall is torn down.

1991
Model aircraft receivers convert to a "narrow-band" technology. Modelers' conversations include such questions as "Are you 'gold sticker'?"

1994
Cline proportional-control fuel system (regulator).

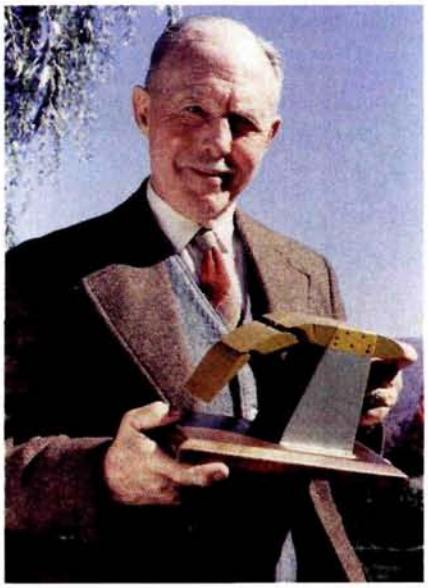
First turbine jet model competes at Top Gun.

1994

kitted this model—along with many other fine designs—for many years, and many Aeromasters were flown back in the 1960s and '70s. The model was a semi-scale biplane (sort of a skinny Pitts Special), with a 48-inch wingspan. It was a great flier and very aerobatic. Today, Great Planes offers a giant-scale version with a 73-inch wingspan.

Pylon racing is another category that has continued the development of aircraft design by pushing the speed envelope a little bit each season. The milestone here was the actual creation of the event, and that honor goes to Jerry Nelson. It was inevitable that once a number of frequencies became available and more than one model could fly at a time, pylon racing would follow. It's still popular today and requires very sophisticated, scale-like racers and highly skilled pilots at its highest levels of competition. In the unlimited class of giant-scale racers, speeds of 200mph are commonly exceeded.

In the world of jets and ducted-fan development, a number of people have been at the forefront, including Tom Cook, Bob Kress, Bob Violett and Larry Wolf. They have all contributed in a big way to the advancement of ducted-fan technology. Dave Platt also deserves a mention here, since he was the first to fly an R/C ducted-fan model in scale competition. He competed with his Douglas "Skyray" at the 1975 AMA Nationals.



Charles Hampson Grant was the editor of* Model Airplane News *from 1932 to 1943. Here, he holds one of his many patented devices: an articulated aeronautical flap.

In my mind, a milestone jet model was Tom Cook's big, twin-engine F4 Phantom. This was a very impressive model to see and hear perform. Bob Fiorenze competed with one that had a unique operating canopy and drogue chute.

I witnessed another impressive milestone at the 1992 Top Gun: a demonstration of a true, gas-turbine engine. It was a French JPX turbine, and it powered a Byron F-16 Falcon. It was the hit of the show.

The hands-down milestone winner for helicopters goes back about 25 years to Dieter Schluter and his demonstration flights at the Toledo, OH, Weak Signals R/C Show. Dieter's realistic flights with his big Hughey "Cobra" intrigued everyone. Its success got many modelers into choppers. Along the chopper lines, Kavan earns a mention for his collective-pitch-equipped Bell Jet Ranger and the use of the first tail-rotor-controlling gyro.

It's a difficult task to pick a milestone for gliders. Again, it boils down to the year-by-year development of building, launching and flying techniques. Composites have played a big role in recent years. One model that stands out for its advanced design and construction techniques is the "Hobie Hawk." The Hobie part was Hobie Alter of "Hobie Cat" sailing catamaran fame. His construction methods were quite unusual for the time. The Hawk's flight surfaces were made of blue foam covered with 1/64-inch plywood. These were built up with a beautifully curved dihedral, and then square areas were routed out of the wing to form ribs. The fuselage was made of fiberglass and plastic. It was available covered or uncovered and ready for a radio installation. It was one of the first ARF gliders.

ALMOST READY TO FLY

If there is a milestone in the field of ARFs, it belongs to Lanier RC, which must be doing something right to have produced ARF models for as long as it has. Len Purdy started Lanier in 1947 and produced escapement control equipment. From 1955 to 1963, Len produced plastic and foam ARFs, including the Lanier Comet that is still in production today. Though Lanier was one of the early ARF companies, radio manufacturer Babcock produced R/C equipment and plastic ARF models in the early '50s. The company had a Piper Tri Pacer and an Aeronca Champ designed, I believe, by Chuck Hollinger.

ARFs are now accepted by R/C'ers, and trainer, aerobatic and scale ARF models are common sights at any flying field. Whether ARFs are good or bad for the hobby is an ongoing controversy; time will tell.

I can't talk about milestones without mentioning a true "milestone" man: Maynard Hill. Maynard has set—and holds—many FAI records for R/C speed, distance, duration and altitude. I've worked with Maynard and know the effort he puts into his record-breaking attempts. His latest effort is to fly a hobby-type R/C model across the Atlantic Ocean. I'm sure he will succeed.

There are other milestones that I have not discussed, including certain construction materials. It would take an entire article to cover all the modern materials and techniques. I will, however, mention two that I feel have had the greatest impact on model building. The introduction of MonoKote covering film and Hot Stuff cyanoacrylate (CA) glue reduced model building and finishing time considerably. They have just about completely replaced silk covering and Ambroid glue.

The choices of milestone aircraft that I've made here are based on memory and much research. All in all, a look back reveals great strides in modeling design, electronics and technology. Who can say what lies ahead of us? I'm sure it will be impressive.

Editors' note: we thank Frank Gudaitis, Dave Gierke and Bob Aberle for the use of their photos.

1995

1996 EPP foam used in an R/C model airplane.

1998 Automatic in-flight mixture control for propeller engines.

1999

O.S. introduces the first model-engine fuel-injection system.

Digital servos introduced.

3,000mAh NiMH cells introduced, promising 50 percent longer flight duration.

JR's 10X exemplifies advances in radio control.

1999

Late '90s

Piezo gyros used in models.

Manufacturers offer ready-to-fly aircraft with engines and radios installed.

The 31st Northwest Seaplane

by Jerry Nelson

THE PORTLAND, OR, Sky Knights R/C club has hosted the Northwest R/C Seaplane Championships for 31 years now, typically on the weekend after the Fourth of July. For the last several years, the picturesque Pine Hollow Reservoir, which is about 30 miles east of Mount Hood and two hours east of Portland, has been the home of this great seaplane competition.

Contestants compete in three, low-key, fun-fly-type events. Points are awarded after each contest, and the overall winner is determined by total points earned. Entrants may use the aircraft that is best suited to each event, so they are not limited to using only one plane.

Jim Weaver's Maul M-5 Rocket won him first place in both the scale and scale static categories.

Why can't autogyros use floats? Jerry Holcomb's may have been a bit slower than everyone else's entries, but it cornered like it was on rails.

Although Al Franklin's 1/4-scale Grumman G-44A Widgeon didn't fly at the event, it certainly made a good impression on spectators and contestants.

PHOTOS BY JERRY NELSON

Championships

Not only did Dick Hansen fly this model of Denmark's WW I HM-2, but he also still flew his 35-year-old Cub that still has all of the original components!

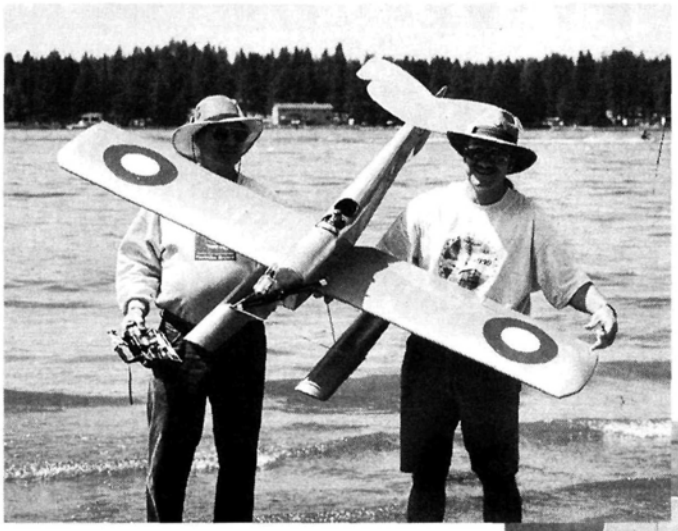
The electric-powered Sig Senior Kadet shown here is piloted by Terry McGill. This 11-pound model took the prize for best electric.

Steve Milos's Edo OSE1 is scratch-built and includes a SuperTigre 90 as well as working flaps.

This full-scale Aeronca Seadan gave spectators an enjoyable noontime show with landings and takeoffs done in front of the flightline.

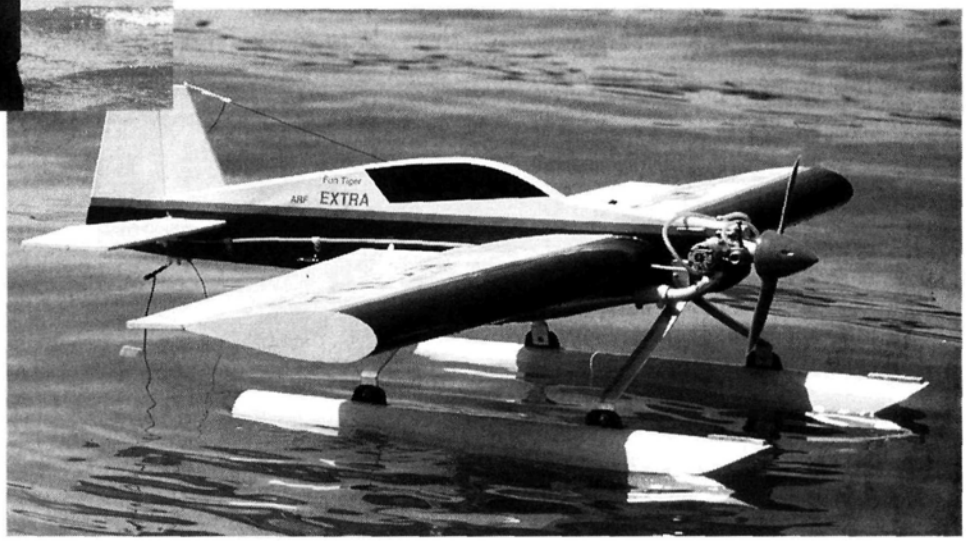
WINNERS

EVENT	WINNER	AIRCRAFT USED
Scale	Jim Weaver	Maul M-5 Rocket
Scale (static only)	Jim Weaver	Maul M-5 Rocket
Fun-Fly	Jason Tate	Weaver Whatiz
Electric	Terry McGill	Modified Sig Sr. Kadet



Left: Dick Hansen and Larry Shepard proudly show off their model HM-1. Like the HM-2, this craft was built in Denmark during WW I and was specifically designed as a seaplane.

Below: at the Championships, ARFs are welcome, too. Mark Findlay's Thunder Tiger Extra was made for water with its Jim Weaver floats.



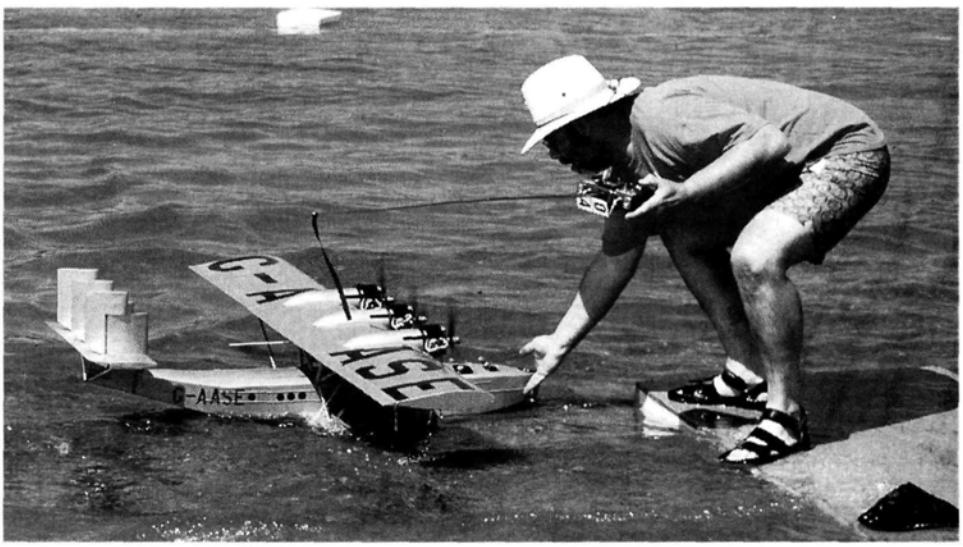
On Saturday, the "mail run" was first. Organizers set up two 10-foot-high pylons in the water about 300 feet apart and about 100 feet from the takeoff site. After takeoff, you have 4 minutes to fly around the pylons as many times as you can. The more laps you make, the more points you earn. A loop or a roll during a lap merits additional points. To make things more fun and less predictable, the model must land and taxi back to the pilot after each lap, and the pilot must "deliver the mail" by touching the model before doing another lap. Pilots earn more points by landing in a designated area after a lap.

The bomb drop was second. Similar to the mail run, there is a 4-minute cap, and pilots earn points for each lap completed before the time expires as well as for accuracy and the execution of loops and rolls. The difference here is that the pilot must try to drop a bomb into a target area instead of touching the plane after each lap.

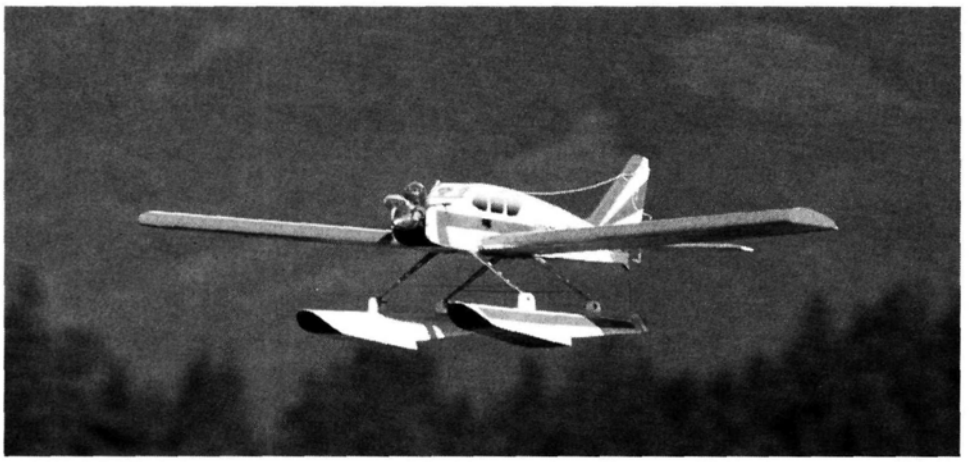
Last but not least, the "infamous" double limbo was on Sunday. An additional pole is placed 20 feet from each existing pole. These two sets of pylons form entry and exit gates. The model must be flown between these gates and under the tops of the poles, although an actual limbo pole is not used. As with the other events, you have 4 minutes to fly as many laps as you can. You also still earn points for loops and rolls, but because of the low altitude and increases in lap times that these maneuvers cause, only an adventurous few attempted them. Some contestants managed more than 10 laps!

There were many well-done scale aircraft at this event. Predictably, a lot of Piper Cubs, from ⅕ to ⅓ scale, could be seen around the pit area. After all, for many the Cub is the seaplane standby. I must give credit to my flying buddy Dick Hansen, who flew a 3-channel Berkeley J-3 Cub that he built in 1964. This 35-year-old R/C plane still has its original silk covering and throttle-equipped O.S. 40 Rat Race engine. Dick has regularly flown this airplane ever since he built it, and he has even let me do several dozen touch-and-go's with it.

It may not be as spectacular as some of the aircraft at this event, but my favorite was flown by Jerry Holcomb of Vancouver, WA. This 3-channel, .15-powered autogyro flew great. It took off from the water just like the other models and turned around the pylons as tight as if it were on rails. It was extremely smooth and under perfect control at all times. Holcomb's autogyro may not have flown as fast as some of the other planes, but it



This 1/12-scale version of the one-of-a-kind Super Marine Air Yacht can be credited to Jerry Holcomb, who has been flying this 8-servo beauty for over 8 years!



hydraulically operated. This Widgeon also features RAm running and landing lights and F&M Enterprises Stits Lite paint. Sometime in 2000, G&P Sales of Angulin, CA, will release a kit of Al's creation.

Al's Widgeon had been flown one time prior to the championships. The model easily lifted off from the water, but as soon as it was a few feet high, one of the engines started to act up, and Al landed it immediately. This resulted in minor damage, which Al repaired, but he hadn't had time to test it, so he didn't attempt to fly the model. However, his Widgeon was made to fly, so look for it at future float flys.

Top: Mount Hood stands tall behind the Wenzel family's Hobbico Brite Star Forty. Team Wenzel consists of 13-year-old Tommy, mom Audry and dad/mechanic Dan. Above: although almost all of the landings were successful, mishaps do happen, and the retieval boat and its pilots would spring into action.

Left and above: there was a great turnout for the 31st Northwest Seaplane Championships. The large number of entrants assured that there would be a wide range of aircraft and that there would be plenty for the spectators to see.

certainly flew the shortest course. With the engine throttled back while flying into the wind, the model appeared to hover just like a helicopter. Jerry says the model is easy to fly and that it doesn't have the maintenance problems of a regular helicopter. According to him, anyone who can fly a model airplane can easily fly his autogyro.

Another stellar craft was Al Franklin's (Lynnwood, WA) ¼-scale Grumman G-44A Widgeon. Modeled after the Link-Lockheed-converted Super Widgeon, this beauty was not flown, but Al did display it. He made the drawings of this 12-foot-span craft as well as the fiberglass molds. His 45-pound model was detailed after a plane formerly based in Anchorage, AK. The fuselage, floats and nacelles are fiberglass, and the foam wing is covered in fiberglass. Two O.S. 320 Pegasus 4-cylinder, 4-stroke engines with McDaniels onboard glow drivers power Al's model. The self-designed, scale, retractable landing gear as well as the retractable tip floats are

A first-class camping area adjacent to the flying site includes RV sites with water and power hookups. There are also shower and laundry facilities, a general store and a great restaurant. Many of the modelers were there as early as Wednesday for sport flying and practice. Contestants and spectators came from all over the Northwest, including Canada, to enjoy the festivities, which included a free, Saturday-night barbecue.

The Sky Knights R/C club organized this event very well. Joe Topper, Bob Rasier and Jim Weaver were the most visible in running it, but it was obvious that many other Sky Knights helped out behind the scenes. If your summer plans take you to the beautiful Northwest next year, be sure to compete in or just watch the 32nd annual Northwest Seaplane Championships at Pine Hollow on the weekend after the Fourth of July. For more information, contact the Portland Sky Knights' website at www.jps.net/smilos.

The Portland, OR, Sky Knights R/C club thanks the following sponsors of the 31st Northwest Seaplane Championships, without whom this great event would not have been possible.

Aero Sports Hobbies
Airtronics
Byron Originals
Coin Corner Hobbies
Du-Bro
Ernst Products
Farm Toys and Hobbies
Fourmost Products
Hansen Scale Aviation Videos
Hobbies Unlimited
Hobby Town USA
Manhatten Glass
Pine Hollow Lakeside Resort
Proctor Enterprises
R/C Modeler Northwest
Sig Mfg.
Tammie's Hobbies
Terry McGill Equity Group
Zona

Holiday WISH LIST

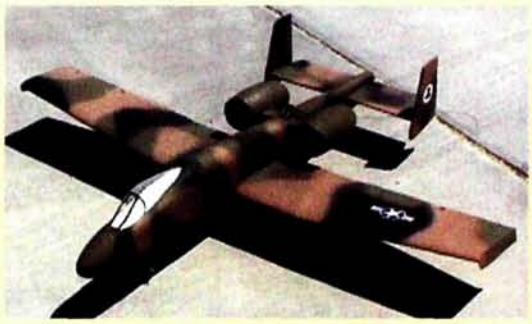
by the Staff of Model Airplane News

Foamie Fun-derland

A beautiful sight, Robart's* Foamie in flight—you're talkin' R/C fun that's launched by hand. Take a ½A engine, such as the Norvel* .061 ($39.99), and join it with Robart's Top Gun foam-gliders series ($9.95) for simple, inexpensive fun! Robart, (630) 584-7616; Norvel, (800) 665-9575.

Fan-tasy Land

If you haven't been placed on the naughty list this year, ask for one of Electric Jet Factory's* warbirds. Its hot A-7 and award-winning A-10 are the hot tickets this year for jet-fighter wannabes. Polar residents can also use the jet to blow the snow off the sidewalk! Electric Jet Factory, (520) 579-5609.



Gull-Wing Gift

What's the matter there, bunky? You want a big ol' Corsair but don't want to build that nasty inverted gull wing? Global's* new .46 ARF Corsair requires you to do nothing more than take it out of the box—that's it! It's a home run at $219.99. Might as well go for a good radio while you're at it: Airtronics'* feature-packed RD6000 (see Aug. '99 *Model Airplane News*) is the hot ticket in multi-memory programmable radio gear. Street price? Figure around $265. OK; it's time to be subtle now. Cut this one out and paste it prominently on the refrigerator. Global, (714) 964-0827; Airtronics, (714) 727-1474.

St. Nick Ziroli's GSE 2000

Jolly ol' St. Nicholas,
What do you have there?
Something for giant-scalers
Taking to the air.
Ways to pump the retracts,
A place to keep your gas,
Even a small extinguisher
It's truly multi-tasked!
Nick Ziroli Plans, (516) 467-4765.

Itching but Can't Scratch?

Some folks don't have time to deck the halls with their scratch-built favorites. Previously available as "plans-only," Rich Uravitch's 51-inch-span Fokker D-VII, the 52-inch OV-10 Bronco and his 50-inch SE-5A have joined Hobby Hangar's* wonderful line of impeccable laser-cut kits. For about $120, you can show up at the flying field with your favorite bird. Hobby Hangar, (606) 334-4331.

"He's makin' a list; he's checkin' it twice, gonna find out who's naughty or nice ..."

We're sure *you've* been good all year, so here's a subtle way to let Santa's helpers know what you really want this holiday season!

No Strings Attached

Nobody—except maybe the Grinch himself—enjoys hinging. Great Planes* Slot machine remains one of our favorites for simplifying this chore, but could GP have improved it? Yes; the Slot Machine is now available in a cordless version! ($79.99). Great Planes, (217) 355-9511.

Dear Santa,
I want to convert a free-flight airplane to R/C like that Bearcat I saw in the November '99 Model Airplane News. Could you bring me one of the Dumas* model kits and a nice, lightweight receiver from FMA* with their teeny speed control? I'd also like to power it with an AstroFlight* motor. Oh, and one of those Hitec* Flash 5 radios to control it —you know, that new System X ($200).

Your pal,
Bobby

Dumas, (520) 623-3742;
FMA, (800) 343-2934;
Hitec RCD, (858) 748-6948;
AstroFlight, (310) 821-6242.

Bending the Budget

An invaluable tool that costs less than 10 bucks is the Du-Bro* Tubing Bender ($9.49). It makes short work of ⅛-inch bending chores and certainly is a reasonable request on the gift list. Du-Bro, (800) 848-9411.

Three Times the Fun

The weather outside may be frightful, but you can have a delightful time flying indoors with this little 28-inch-span Fokker Dr.1 Triplane from Hobby Lobby Intl.* This easy-to-assemble slow flyer will also be a blast to fly at the field or in your backyard after the snow melts. For $369, you'll have everything you need: the triplane kit, Hitec Focus 3 transmitter with two microservos, an accessory pack, Speed 280 drive system, prop, speed control, battery and charger. Hobby Lobby, (615) 373-1444.

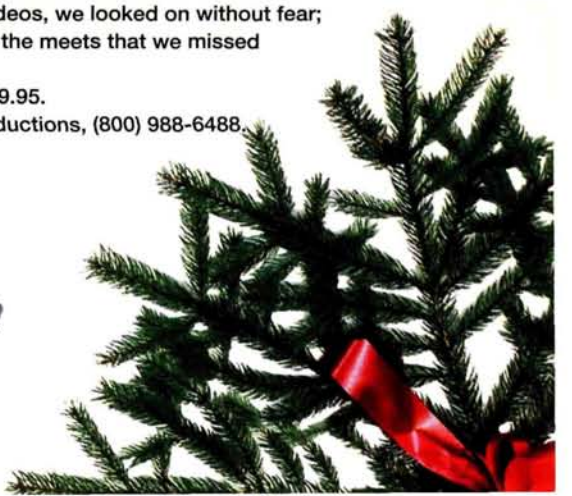
'Twas the Night Before Christmas

... and all through the room,
Jets flew by quickly, with a buzz and a zoom.
Watching SKS* videos, we looked on without fear;
We could still see the meets that we missed this past year.

SKS videos, $19.95.
SKS Video Productions, (800) 988-6488.

Snow Blind

So, that kit you've been waiting so long for magically appeared under the tree, eh? Don't lose it just because you are blinded by the sun's early-morning rays bouncing off the snow. Ask for a pair of Zurich Intl.* sunglasses and, for only $49.95 and up, protect your gift—and your eyes! Zurich Intl., (800) 533-5665.



Holiday WISH LIST

Trimmin' the Tree

Replace that beat up Moto-tool with a Dremel* 398. From $99, you can't beat the price, and with the electronically set speeds, you'll be able to find the right pitch to drown out Uncle Frank's snoring after Christmas dinner. Dremel, (414) 554-1390.

A Better Yule Log

Why spend your holidays watching a Yule log on TV when you could be watching Dave Platt's* new Black Art series of videos? Learn how to build and finish that new warbird for only $34.95 each (buy more than one and save!). Dave Platt, (407) 724-2144.

Hunka (Afterburning) Love

What's that? Your radio has a multi-model memory, and you're yearning to fill that last slot? Run down and hit the ATM for a cool 14K and pick up this Bob Violett Models* Rafale B 01. The largely prefabricated kit includes retracts, Kevlar fuel cells, brakes, necessary hardware—and best of all—the engines. Twin RAM* 750 turbines mean faster chestnut roasting. Bob Violett Models, (407) 327-6333; RAM, (305) 595-1416.

Jet-Set Fun In Florida

Here's a Christmas present you can give yourself—a trip to sunny Florida to attend one of the hottest model events going: Florida Jets, March 2 through 5, 2000. The event tickets are so inexpensive ($5) that you can attend the Saturday night jet pilots' award banquet for only $25 a seat and even treat yourself to a stay at the Harbourside Hotel for $125 a night! Check airfare and hotel information with Cindy Burkett, the official travel agent for Florida Jets, at (800) 752-5615.

Warbird Combo

For warbird lovers on every front, a holiday wish list wouldn't be complete without a powerful, WW II fighter; in this case, Meister Scale's* new 84-inch-span Me-109. Now add to that a Brison* 3.2 gasoline engine complete with a CH ignition system, and you really have something. The 109 is all wood and has many scale accessories, including retracts, metal spinner and formed plastic parts. The engine ... well, see the review in this issue. Together, these impressive bits of military hardware will satisfy. Meister Scale, (910) 562-3700; Brison, (972) 341-9152.

Sleigh Simulator Next?

Do you want to stay inside this winter, but you also want to fly? Check out Great Planes' "RealFlight" Deluxe R/C simulator. It now includes helis, too; so, starting from $239.99, you can brush up your skills over the holidays without braving the temperatures or taking risks with your plane. Great Planes, (217) 398-6300.

Holiday Blues (and Yellow)

An Ultracote-covered, dark blue and yellow Fairchild PT-19 by Hangar 9* would make a nice, gift-wrapped surprise. With less than 20 hours of building time, you could have this $329.95 military trainer in the air by December 26! Horizon Hobby Dist., (217) 355-9511.

Sticking Hinges

Planes can be difficult to find when they're buried in the snow, so ask for some Pacer* Hinge Glue to make sure that your hinges stay put and to prevent that post-crash snow search. The street price of $2.89 is a small one to pay to help keep your craft in good condition. Pacer Technology, (800) 538-3091.

Let it Snow ...

So it's 20 below, there are two feet of snow on the ground, and you can't drive to the field; who cares? With Great Planes' Slowpoke ($89.99), you can do your flying in the backyard until Jack Frost has had enough. Great Planes, (217) 398-6300.

North Pole Pylon Racing

The Lanier* Dominator 500 could beat Santa from house to house, especially when attached to the Tower* .46. If you were nice, ask for this combo and be a force at your club's next pylon races. If you were naughty, maybe you can hook up the .46 to your lump of coal. Lanier RC, (770) 532-2163; Tower Hobbies, (800) 637-4989.

Glide Through the Holidays

If you're looking for something to do while Christmas dinner cooks, why not fly your new Dave's Aircraft Works* Ka6E? Of course, you'll have to ask Santa to bring you this EPP-foam aerotow glider, but at $189.95, ask away! Dave's Aircraft Works, (949) 248-2773.

Revlite vs. Reindeer Power

If you're a fan of Norvel's powerful ½A engines, just imagine what its .25 Revlite ($84.99) must be like. In their workshop, the Norvel elves (Norvelves?) have produced an engine that is 25-percent lighter than a comparable-size ABC engine. This is possible through their ceramic-piston cylinder technology. Other than a popcorn ball, could there be a better stocking stuffer? Norvel, (800) 665-9575.

Request on the Radio

Why waste Christmas wishes on radios when you can get one that will work for all your planes? The JR* PCM 10x has 10-model memory and DataSafe™ computer backup, so you can store an infinite number of planes on it. For the street price of $1,249 with case, you'll never need another radio. Horizon Hobby Dist., (217) 355-9511.

*Addresses are listed alphabetically in the Index of Manufacturers on page 158.

The best sites for R/C

The Internet has revolutionized the world and the R/C airplane hobby. Just as the steam engine ushered in the Industrial Age, the World Wide Web has propelled us into the Information Age.

Information on where to buy, where to fly and how to get started in R/C aeromodeling is rapidly accessible and easily available for those connected online. Merchants of R/C kits, radios, power systems, tools and accessories have set up shop online. R/C clubs and organizations keep in touch with their members and provide information to prospective members via their websites. Building, flying and design information is available at the click of a mouse after, perhaps, a brief search using one of the powerful online search engines.

To prepare this overview of aeromodeling resources available on the Web, two cyberresearchers visited more than 600 R/C modeling websites and logged some of the best for this report. One researcher was an HTML coder and website designer, the other an R/C modeler and journalist. Websites selected for this presentation met high standards of screen design and information density. They are quick to load, look good and are easy to navigate. They tend to be highly informative, answering common questions or providing information not readily available elsewhere. Examples are online catalogs of airplanes, frequently asked questions (FAQs) and guides to selecting, building and flying R/C models, and instruction manuals for engines, instruments and equipment.

Bear in mind that the Internet is dynamic. It changes day-to-day and even hour-to-hour. What was available online yesterday may not be there today. What you are unable to find today may be obtainable tomorrow. The best way to discover what is available in cyberspace is to use Internet search engines.

How to Get Started in R/C Flight

Every R/C flier was a beginner once, longing for information on how to get started. Fortuitous for newcomers in the Information Age, plenty of information on model selection, about plane construction, on preparation hints and tips, and even on the basic principles of flight is available on the World Wide Web. Many learn more quickly from a live flight instructor, and this section tells you how to find one in your area. If you're on your own, however, here are some introductory themes for getting the fundamental information you need to prevail.

All About Radio Control
www.eastcoastmodelcenter.com /document/introrc.html. Canada's largest online R/C shop; catalog; credit cards accepted.

Fatlion R/C Sailplanes
www.fatlion.com.
Basic info on radios; thermal- and slope-soaring.

Get Started in R/C
www.radiocontrolled.com. Basic information for novice R/C'ers and links to books and magazines.

Get Started in Radio Control
www.towerhobbies.com/intros/index .html. Kits, accessories, instruction; catalog; credit cards accepted.

How to Fly an R/C Model Without an Instructor
www.hobby-lobby.com/howto.htm. Learn to fly with a slow-flyer model; catalog; credit cards accepted.

R/C Aircraft FAQ
www.drones.com/RC-faq.html. Shamim Mohamed R/C Frequently Asked Questions.

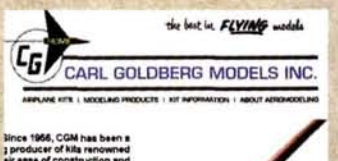
Rudy's R/C Soaring
www.garlic.com/~rudynix/rudynix /soaring1.html. Beginner articles and links to beginner information.

Temple Hill Slope Squadron
home.earthlink.net/~windrider007 /basics.html. For beginner fliers.

Glow Power R/C Airplanes

Glow power makes up the broadest portion of the R/C flight world, so naturally there is more Web-based information available for alcohol-burners than for all other types of R/C aircraft combined. Fuel power spills over from this category into other classifications and Special Interest Groups like racing, aerobatics and R/C combat. Listed here are predominant suppliers of glow-power R/C airplanes.

AirBorne Models
www.airborne-models.com. Giant-scale ARF kits.



Carl Goldberg Models Inc.
www.goldbergmodels.com. Information on kits, accerssories, Ultracote and more; also see movie of Sukhoi in flight.

D&L Designs
www.mindspring.com/~dldesigns. Scale kits and plans; program for event-scoring; catalog; credit cards accepted.

Dynaflite www.dynaflite.com. Glow power large and small, sailplanes.

FiberClassics
www.fiberclassics.de. Molded fiberglass airplane kits; props and jets.

FMA Direct
www.fmadirect.com. Receivers, servos, speed controllers, electronics; catalog; credit cards accepted.

Fox Manufacturing
www.foxmanufacturing.com. Famous glow engines.

Global Hobby Distributors
www.globalhobby.com. Product information, hobby shop lists and links.

Great Planes Model Mfg.
www.greatplanes.com. Product info on kits, MonoKote, RealFlight Simulator; catalog; credit cards accepted.

Herr Engineering
www.iflyherr.com. Small glow-power and rubber free-flight models.

Hobby Hangar
www.hobbyhangar.com. Airplane kits, tools and links.

House of Balsa
www.mag-web.com/rc-modeler /hobnew/index.html. Balsa kits for glow engines and sailplanes; catalog.

Kyosho
www.kyosho.com. Info on Kyosho fuel-power and electric-power airplanes.

Mud Duck Aviation
caseynet.com/mudduck. Big, slow-flying glow-power planes; catalog; credit cards accepted.

Survey

by Paula Garwood

Norvel Engines
www.norvel.com. Norvel engines, Herr planes; catalog; credit cards accepted.

O.S. Engines
www.osengines.com. Information on O.S. airplane, car, boat and heli engines.

Planes Plus Online
www.planesplus.com. Fast, complete information.

RJL Industries
www.mecoa.com. Large model engine site.

Sig Manufacturing Co. Inc.
www.sigmfg.com. Information on Sig kits.

SkyHobby www.skyhobby.com. Airplanes, helicopters, engines, accessories; catalog; credit cards accepted.

Top Flite www.top-flite.com. Top Flite kits, MonoKote, dealer locator; catalog.

Wildcat R/C Fuels www.wildcatfuel.com. R/C glow fuel, glow plugs, engines; catalog.

Sailplanes

Aah, the grace and majesty of motorless flight! A barrage of information about soaring is available on the Web, from choosing your first glider to finding thermals and mauling the slopes with full-contact, combat EPP-foam sailplanes.

Dave's Aircraft Works
www.davesaircraftworks.com. EPP-foam combat and more; catalog; credit cards accepted.

DJ Aerotech
www.bright.net/~djwerks. Innovative sailplanes and slow flyers.

MM Glider Tech
www.mmglidertech.com. R/C combat slope sailplanes.

Northeast Sailplane Products www.nesail.com. Slope and thermal kits, accessories. 25 articles; catalog; credit cards accepted.

Radio Carbon Art
www.radiocarbonart.com. Paul Naton's Endless Lift videos.

Sailplanes Unlimited
www.sailplanes.com. Imported fiberglass scale kits.

Slegers International
www.slegers.com. Competition sailplanes and more.

Slope-Scale Sailplanes ourworld.compuserve.com /homepages/slope_scale. Fast semi-scale warbirds.

Electric Power R/C

For those who shun oily planes, electric-powered flight has made enormous headway in recent years and is dominating the market in micro- and indoor flight. Much information is available from the big suppliers, and even more from small makers, designers and suppliers.

Acer Racing
www.acerracing.com. Connectors and electric accessories.

AstroFlight
www.astroflight.com. Motor and controller manufacturer.

Dallas Electric Aircraft Flyers (DEAF)
web2.airmail.net/warner1/deaf /index.htm. Articles, pictures, contests, many links.

Electric Flight in Colorado
www.bcrews.com/~cgadd/eflight /planes.html. Articles, links and calculators.

Electric Jet Factory
www.ejets.com/. Electric jets; nothin' but jets; catalog; credit cards accepted.

E-Zone
www.ezonemag.com/. "The virtual home of electric flight."

Minnesota Area R/C Electric Enthusiasts
www.isd.net/mmmpc535/. Many articles, links, general information.

Silent Electric Flyers of San Diego www.sefsd.org/. Calendar, links, many resources.

Trick R/C www.zagi.com. Electric flying wing. Massive website. Slow-loading.

Slow Flyers

In the last year, slow flyers, park flyers and backyard flyers have taken the R/C modeling scene by storm. Hobby Lobby is an early major supplier of these fascinating planes; now other designers, makers and suppliers are coming on fast.

Braun Modelltechnik Slow Fly www.braunmod.de/. All areas of "English" site not yet complete.

David Lewis's Homefly
www.homefly.com/. Slow-flyer and micro-R/C.

Dick Gibb—Slow Fly
www.cyberia.com/pages /curmudgeon/. CO_2, rubber, free-flight and slow flyer R/C.

Indoor Model Airplanes
www.n-lemma.com/indoor/. Photos, clubs, contests, kits, suppliers, lots of info.

Kai's Modellflugseite—Slow Fly
home.t-online.de/home/e-huber/. Good-looking. In German with dictionary translator.

McGaag Slow Fly
meltingpot.fortunecity.com /nevada/912/. Not a lot of info, but good pictures of models.

Skyhooks & Rigging
www.mentornet.org/WES.htm. Devoted to indoor electric, R/C and free-flight model flying; catalog, credit cards accepted.

Todd's Models
www.toddsmodels.com

Wayne's Indoor World
www.mpx.com.au/~theferal/wiw .html. R/C slow-flyer airplanes.

Micro R/C

Who hasn't dreamed of teeny-weeny remote-control planes you can fly in your living room? Well, now they're available in real life. These diminutive flyers spur the imagination, and we can expect to see an explosion of micro kits and micro equipment available for them—all of which is likely to be seen first on the Web.

JM Quentin's Drosophile Indoor Biplane ourworld .compuserve.com/homepages /jmquetin/Drosodee.htm. Droso motor data. Seaplane version with more powerful motor available.

Matt's Micro R/C Airplanes www.geocities.com/CapeCanaveral/Launchpad/2274/. Micro R/C planes.

Microstuff www.microstuff.net/. Super lightweight and indoor R/C aircraft; catalog; credit cards accepted.

Pixel Micro Helicopters www.planetinternet.be/pixel/. Limited but well-done site.

Small Net www.eskimo.com/~smallnet/index.html. Supply sources, articles, photographs.

WES-Technik Micro R/C Supplier www.idnet.de/homepage/scholl/. Micro R/C supplies.

Giant Scale

These planes darken the sky as they pass overhead, and they are very impressive up close, as well. Covered in this section are specialty kit makers, motor suppliers, and accessory makers for powered planes with wings that span 80 inches or more.

Aero Works www.aero-sports.com/aeroworks. Edge 540, Laser 200, Extra 300L, Giles 202.

Aerotech Models www.wavetech.net/~aerotech. Large-scale, highly detailed WWII warbirds.

Aircraft International www.aircraft-intl.com. Giant-scale motors; catalog.

Cactus Aviation www.cactusaviation.com. Large planes and engines.

Desert Aircraft www.desertaircraft.com. Giant-scale kits, engines, propellers.

Giant-Scale Aerobatic Website www.gsal.us-inc.com/. Articles, reviews, photos, news.

Giant-Scale Air-Racing Headquarters www.hyperflight.net. Lots of info, racing lists, clubs, links.

Giant Scale by Custom Cutters rcplanet.com/customcutters/. Complete site; limited offerings.

Giant-Scale News and Reviews www.aerosports.com/ponteri/index.html. Online newsletter.

Giant-Scale R/C Links www.fly-giantrc.org/links.html. All links concern giant-scale R/C in some manner.

GiantScalePlanes.com www.giantscaleplanes.com. Specs and info for Hobbies and Helis' S-30065 Staudacher.

Joe Nall Giant-Scale Fly-In www.hartness.com/events/nall/joenall.htm. Largest giant-scale meet on the East Coast.

Unlimited Scale Racing Assoc. www.usra-racers.org/. News, updates, photos, race results.

Wendell Hostetler Plans www.aero-sports.com/whplans/. Designing giant scale since 1979.

R/C Jets

Ready to go fast? Do models of airplanes built since the Korean War capture your imagination? Maybe ducted-fan, turbine-powered, or pusher-prop jets are just the thing for your next project.

Air Magic www.metro.net/airmagic/. CNC-machined instrument panels; catalog.

Bob Parkinson Models www.rcjets.com/. Specializes in "first jets"; catalog; credit cards accepted.

Bob Violett Models www.bvmjets.com/indexhs.htm. DF and turbine jet kits; built models for sale; catalog.

Century Jet Models www.centuryjet.com/. Order DF kits and accessories online; catalog; credit cards accepted.

Combat Models members.aol.com/cbmjets. Pusher-prop jets; catalog; credit cards accepted.

Gas Turbine Builders Association www.gtba.cnuce.cnr.it/. Treasure-trove of information.

Jet Hangar Hobbies www.jethangar.com/. Kit info, construction and technical advice.

Mach 1 Composites www.neumanngroup.com/mach1/. Glow and electric jets, building service.

RAM Microjets www.ramicrojets.com/. Small turbine engines; catalog.

Online Hobby Shops

Not everyone has a neighborhood hobby shop nearby. Here are online hobby shops. With World Wide Web access, it doesn't matter what neighborhood they're in; you still can shop there. Hobby shop websites generally make their latest catalog available online, and many allow you to order online with a credit card.

Ace Hobby Distributors www.acehobby.com. Listing of local distributors.

America's Hobby Center www.ahc1931.com. Large hobby shop; catalog; credit cards accepted.

Bruckner Hobbies brucknerhobbies.com. NYC discount hobby shop.

Hobby Horse www.hobbyhorse.com. Online hobby shop; catalog; credit cards accepted.

Hobby Lobby International www.hobby-lobby.com. Amazing diversity of parts and accessories; catalog; credit cards accepted.

Hobby Supply South www.asiaonline.net.hk/~amd. Slope jets and warbirds, power planes and hand-chuckers.

Horizon Hobby Distributors www.horizonhobby.com/product/index.asp. Major league supplier of kits, parts, accessories.

J&C Hobbies www.jchobbies.com. Hitec radios and more; catalog; credit cards accepted.

Major Hobby www.majorhobby.com. Radios, balsa planes; catalog; credit cards accepted.

OmniModels www.omnimodels.com. More than 6,000 items available online; catalog; credit cards accepted.

RCstore.com www.rcstore.com. R/C model books, plans and magazines; catalog; credit cards accepted.

Sheldons Hobbies www.btown.com/sheldons. Online hobby shop; catalog; credit cards accepted.

Tower Hobbies www.towerhobbies.com. Largest in the USA; catalog; credit cards accepted.

Specialty Parts, Materials, Supplies

Unusual control horns, hinges, retractable landing gear, building boards, covering, paints, tools and supplies can come from the hobby shop or mail-order supplier, but for really unusual items, check out these specialty websites.

Aerospace Composite Products www.acp-composites.com. Lightweight building materials.

Anchor Bond www.anchorseal.com. Epoxies, urethanes and silicones for modelers; catalog.

Chevron Hobby Products www.perfectpaint.com. Paint matches; MonoKote, Ultracote, FS Camo colors; catalog; credit cards accepted.

Composite Structure Technology www.cstsales.com. Composite materials, data and construction articles.

Coverite www.coverite.com. Covering film and fabric, matching paint.

Du-Bro Products www.dubro.com. R/C tools, parts, accessories; catalog.

ElectroDynamics www.electrodynam.com. Electronic devices and miniature turbines.

F&M Enterprises www.stits.com. Stits Lite covering and paint.

Micro Fasteners www.microfasteners.com. 1,000 small-threaded fasteners, sold in quantity; catalog; credit cards accepted.

Nelson Hobby Specialties www.nelsonhobby.com. Fasteners, paint, fittings, lathes and machine tools.

Robart Manufacturing www.robart.com. Retracts, hinges, tools, 7-cylinder radial engine; catalog.

Sirius Electronics www.siriuselectronics.com. Battery charging and maintenance equipment; catalog.

SR Batteries www.srbatteries.com. Aerospace quality battery cells and packs; catalog; credit cards accepted.

Tim McCann's Soaring Products www.alltel.net/~tmccann. Sailplane landing skids and skegs, winch kit; catalog.

Wright Engineering www.wrightengineering.com. Building boards.

Radio Suppliers

Every R/C airplane needs a radio. Here's where to find information on transmitters, receivers, servos and radio accessories.

Airtronics www.airtronics.net. Airtronics radios, servos and accessories.

Futaba www.hobbies.net/Futaba. Futaba radios, servos and accessories.

Hitec RCD www.hitecrcd.com. Hitec radios, servos and accessories.

JR Remote Control www.horizonhobby.com/product/index.asp. JR radios, servos and accessories.

Multiplex multiplexrc.com. Multiplex radios, servos and accessories.

R/C Helicopters

Choppers are for advanced R/C pilots, but when you're ready for the challenge, here are sources for kits, engines and special equipment you'll need for vertical R/C flight.

Beginner's guide to R/C helicopters www.helifever.com/intro/beginners.cfm. Comprehensive site; much info.

Century Helicopter Products www.centuryheli.com. Century R/C helicopter information.

Curtis Youngblood Enterprises www.curtisyoungblood.com. Curtis Youngblood videos.

Dakota R/C members.xoom.com/DakotaRC/. Heli building tips, information and links.

Hirobo www.modelrec.com/mrchiroboh.html. Major distributor of several brands.

Kalt R/C Helicopters www.airtronics.net/kalt/index.htm. Kalt R/C helicopter information; catalog; credit cards accepted.

Kyosho www.kyosho.com/helis/index.html. Kyosho R/C helicopters; catalog.

Yale Hobby Products www.yalehobby.com/index1.htm. Major distributor of several brands; catalog.

Model Airplane Clubs

Flying clubs make tremendous use of the Web; this communications technology is well-suited to getting their messages out. Listed in this section are some sample club websites. This may be the way to find a flying club near you.

Charles River Radio Controllers www.charlesriverrc.org/. Sample power and soaring club.

Cincinnati Soaring Society www.iac.net/~glide17/css. Sample soaring club.

Endless Mountains R/C Flying Club www.dlmorgan.com/emrc/. Sample power club, field latitude/longitude locator.

Inland Slope Rebels ourworld.compuserve.com/homepages/ISR. Southern California slope-site listing.

Tower Hobbies R/C Club Listing. www.towerhobbies.com/rcwairclub.html#usa. Hundreds of R/C clubs listed by state.

Model Airplane Organizations

Modeling organizations have a new way to keep in touch with their members and to recruit potential members. Information about an organization on the Web is available easily and quickly, 24 hours a day, from anywhere in the world, at low cost. Web-based information sources can make more recent information available to more people, at lower cost and in a better-looking package than can traditional newsletters.

Academy of Model Aeronautics (AMA) www.modelaircraft.org. National aeromodeling organization, many links.

AMA District 8 www.ama-dist8.org. Sample AMA District site.

Eastern Soaring League (ESL) www.eclipse.net/~mikel/esl/esl.htm. Regional soaring association.

International Miniature Aerobatic Club (IMAC) www.mini-iac.com/. AMA Special Interest Group for aerobatics.

International Miniature Aircraft Assn. (IMAA) www.fly-imaa.org. AMA Special Interest Group for giant scale.

International R/C Helicopter Assn. (IRCHA) www.ircha.org. AMA Special Interest Group for helicopters.

Jet Pilots Organization (JPO) www.jetpilots.org. AMA Special Interest Group for jets.

League of Silent Flight (LSF) www.silentflight.org. Soaring Achievement program.

Miniature Aircraft Combat Association (MACA) bigwig.geology.indiana.edu/iskandar/maca.html. Control-line combat.

Model Aeronautics Association of Canada (MAAC) www.maac.ca. Canadian national aeromodeling organization.

National Assn. of Scale Aeromodelers (NASA) www.scaleaero.com/amascale.htm. All phases of scale aeromodeling.

National Control Line Racing Assn. (NCLRA) members.aol.com/dmcd143. Control-line racing.

National Free Flight Society (NFFS) freeflight.org. Free-flight model flight.

National Miniature Pylon Racing Assn. (NMPRA) www.nmpra.net/. R/C model racing airplanes.

National Society of Radio Controlled Aerobatics (NSRCA) www.wtp.net/DBEST/patternpage.html. R/C aerobatic pattern flying.

R/C Combat Association (RCCA) www.scalecombat.com. R/C scale combat.

Scale Warbird Racing Association www.inficad.com/~waltf. WW II warbird racing.

Society of Antique Modelers (SAM) www.antiquemodeler.org/index.html. Dedicated to old-time modeling.

Directories, Lists, Sources

The list-compilers are the unsung heroes of the Web. They painstakingly research and compile links to make it

easy for casual users to find what they are looking for. While many websites contain links to other sites, here are some of the more comprehensive lists and links.

California Slope Racers www.geocities.com/MotorCity/3839/race.htm. Slope-site listing.

Complete R/C Model Website Index www.uoguelph.ca/~antoon/websites/rc.htm. Very extensive. More than 2,000 links.

Eastern Iowa Soaring Society Links eiss.cnde.iastate.edu/links.shtml. Extensive listing, hundreds of links.

Manny Tau Soaring Yellow Pages www.planes-wings-things.com/links/links.htm. The granddaddy of R/C soaring links.

Soaring Tools Foamie Info www.geocities.com/~soaringtools. Dedicated to EPP-foam slope sailplanes.

Tower Hobbies Links www.towerhobbies.com/rcweb.html. Far-reaching links service.

Washington Slope Sites www.reddata.com/sass/sites.htm. Slope-site finder.

Research, Design and Development

You're a model designer, and you'd like to try a new airfoil. You're an electric flier, and you'd like to calculate the differences between motor and prop combinations. You need software tools to refine a design you've been dreaming about. Here are examples of what is available today on the Web.

Airfoil Coordinate Utility members.tripod.com/~Andrei_C/AeroFoil/AeroFoil.html. Program to edit downloaded airfoils.

Compufoil—SoarSoft Software www.compufoil.com. Compufoil airfoil-plotting software.

John Yost—EH Airfoils for Tailless Aircraft www.halcyon.com/bsquared/EH.html. EH airfoils for sweptwing tailless aircraft.

Jon's Model Designer ourworld.compuserve.com/homepages/JHopkinson/wing2.html. Web-based program to aid in model design.

KelComp NACA Airfoils www.ctaz.com/~kelcomp/airfoils.htm. Prints NACA 4- and 5-digit airfoils for ribs.

Martin Hepperle—MH Airfoils beadec1.ea.bs.dlr.de/Airfoils/index.htm. Airfoils and model aerodynamics information.

Michael Selig—UIUC Airfoil Data www.uiuc.edu/ph/www/m-selig. The famous University of Illinois airfoil data.

MotoCalc www.motocalc.com/. Program to choose an electric motor for your airplane.

ViaGrafix viagrafix.com. Model CAD and WingMaster design software.

Weather

Most model flying is affected by weather. Slope soarers want more wind, electric flyers want less wind. Thermal sailplane pilots want high lift conditions, power plane pilots want the wind to blow right down the runway. The Web offers unprecedented access to weather information, including maps, observations and forecasts. A lengthy article could be written about weather information and weather observation products and equipment alone, but here are a few sites to start with.

Dr. Dewpoint's Weather 101 www.intellicast.com/DrDewpoint/wx101/. Introduction to online weather courses.

Intellicast Weather www.intellicast.com. Sailcast and Wintcast maps.

Kestrel Wind Meters www.kestrel-instruments.com. Mega-cool hand-held weather instruments.

NOAA Aviation Weather www.awc-kc.noaa.gov. Pretty intense stuff here.

Ohio State University Weather Links twister.sbs.ohio-state.edu/gifs/forecasts/ngm/vectors.gif. 12-, 36-, and 48-hour wind vector maps of USA.

Soaring Weather Reports csrp.tamu.edu/soar/for.html. Intensive amount of detailed data.

SUNY-Albany Atmospheric Science www.atmos.albany.edu/das/favs.html. Links to large number of weather sites.

The Weather Channel www.weather.com. Simple to use.

And Now for Something Completely Different

Where else but on the Web can you read about successful flapping-wing model airplanes? This group also contains the 1999 Webby awards, which are worth a look for hints, tips and tricks for improving your business, club or personal website. Maybe your site will be entered in the 2000 Webby Award contest.

Area Fifty-One Technologies www.afot.com. Roswell Flyer maker.

Blimp Guys www.blimpguys.com. R/C blimps in three sizes.

Flapping-Wing Aircraft www.catskill.net/evolution/flight. R&D continues on flapping-wing models.

Ornithopter Technologies members.tripod.com/ornitech. Ornithopter plans, club; view movies of ornithopters.

Pixel Micro Helicopter www.planetinternet.be/pixel. World's lightest R/C helicopter: 4.4 ounces.

R/C Airship and Blimp Resources www.hotairship.com/rcblimp/index.html. Resource listing for R/C airships.

Remote-Controlled Flying Saucer www.rcsaucer.com/closeup_blimp.html. A 4.5-foot R/C blimp; credit cards accepted.

Webby Awards www.webbyawards.com/. "Best of the best" websites.

Web Search Engines

The Web is dynamic and ever-changing, growing larger and more informative every day. Servers go up and down, and may not be available at the hour or on the day you perform your search. Between the time this article is written and the time it is published, some of the websites listed will have changed location or gone off the Web completely, but you can be assured that more new information comes online every day. One of the quickest and most effective ways to find what you're looking for is with an online search engine. Here are some of the best.

Alta Vista www.altavista.com/. "Plain language" search query structure. Translator.

Excite www.excite.com. Personalize your Excite home page.

Google www.google.com. Absolute cleanest interface. Good for beginners.

Hotbot www.hotbot.com. Simple and advanced search queries.

Inference Find www.infind.com. Meta search. Organizes results into logical groups.

Infoseek infoseek.go.com. Fast response time after query input.

Lycos www.lycos.com. Returns search results in categories.

Microsoft home.microsoft.com. Quick response to search inquiries.

Northern Light www.northernlight.com. Exceptionally clean interface. Easy to use.

Snap home.snap.com. Includes five-day weather by ZIP code.

Yahoo www.yahoo.com. One of the first, and still one of the best.

MODEL AIRPLANE NEWS
FIELD & BENCH
REVIEW

Dynaflite

Fly Baby

A giant EAA classic

by Fran Joslyn

THE FULL-SCALE FLY BABY was designed in 1960 by Pete Bowers to compete in the first (and so far, only) Experimental Aircraft Association (EAA) design competition. The Fly Baby was an all-wood aircraft that could be built in 750 to 1,000 hours, and because of the wood construction, it was fairly inexpensive to build.

Dynaflite's* model is based on this full-scale plane. It, too, is all wood and features a one-piece wing, a clear windshield and a high-quality manual. An optional scale cockpit kit is also available. I searched the Web for information on the Fly Baby and came across Chris Horsten's paint scheme, which I immediately took a liking to.

PHOTOS BY DEBRA SHARP AND FRAN JOSLYN

Fran Joslyn holds her Fly Baby before its first flight.

SPECIFICATIONS

Model: Fly Baby
Manufacturer: Dynaflite
Type: ¼-scale model
Wingspan: 84 in.
Wing area: 1,059 sq. in.
Weight: 11 to 13 lb. (manual); 12 lb. (as built)
Wing loading: 24 to 28 oz./sq.ft. (manual); 26 oz./sq.ft. (as built)
Length: 56 in.
Engine size req'd: .75 to .90ci (12.5 to 14.75cc) 2-stroke; .91 to 1.20ci (15 to 20cc) gasoline engine
Engine used: O.S. Surpass 1.20 4-stroke with 15x6 Zinger* prop
Radio req'd: 4-channel with 6 servos
Radio used: JR X347
List price: $219.99

Features: this plane features a one-piece wing and conventional construction techniques, and it accepts a variety of gasoline and glow engines. All necessary wood parts are included, along with the right and left ABS cowling, cowl-reinforcement strip, three rolled sheets of CAD-drawn plans, clear windshield material and photo-illustrated instruction manual.

Comments: with easy access to the radio gear and engine and an available scale cockpit kit (part no. DYFQ0810), this craft is not only easy to tinker with, but it's also great looking.

Hits
- Excellent wood quality.
- Plywood die-cutting was very good.
- Very good assembly manual with many illustrations and pictures.

Misses
- Instruction manual was somewhat confusing regarding wing construction.

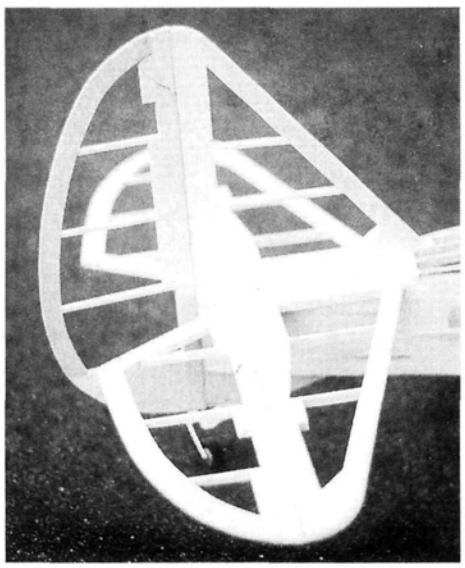
KIT CONTENTS

As I do with most kits, I first reviewed the quality of the wood. The balsa and plywood pieces were in good shape; none was warped, and the die-cutting was clean. The plans are drawn on CAD on three sheets. The instruction manual has ample photos and illustrations and includes suggestions on flying the model.

TAIL FEATHERS

My first step was to tape the tail section plans to the fuselage plans and then cover them with wax paper. I made the fin out of 3/8x5/8x30-inch balsa sticks using medium CA. When you fit the ribs, which are cut out of 1/8x3/8x24-inch balsa sticks, make sure that they fit the leading edge (LE) and trailing edge (TE) well, then sand the fin to shape.

Begin the rudder assembly by laminating the two 1/8-inch TE1 pieces together, then laminating the two TE2 pieces. Glue the TE1 and TE2 assemblies together over the plans with Great Planes* medium CA. I cut, fit and glued the ribs in place then added the balsa hinge blocks and sanded the entire assembly as shown on the plans. Build the stab and elevators on the plans as well, using the same technique as with the fin and the rudder. This completes the tail assembly.



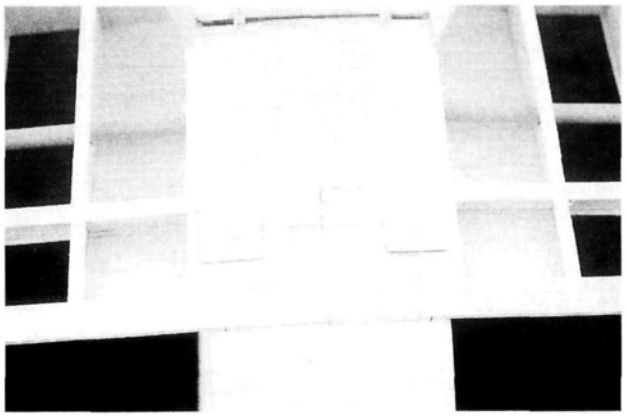
When constructing the fin, stab, elevator and rudder, don't forget to trial-fit the pieces before permanently attaching them.

WING CONSTRUCTION

Because the wing has a semisymmetrical airfoil, I marked the ribs to show the top of each. I also numbered the ribs before removing them from the die-cut sheets. If you do this, you can correctly position them on the spars more easily. Use a dihedral gauge (included with the kit) to set the angle of the center ribs. On the wing's TE, pin a 1/4x3/8x36-inch balsa building jig to the plans where indicated to obtain the proper height of the ribs' TE.

Left: I used an Estes BT20 rocket body tube in each wing panel to serve as a servo-lead guide.

Below: the underside of the Fly Baby's wing. Don't forget to use a fairing block to blend the wing with the fuselage.



When you construct the wingtips, trial-fit all pieces before gluing them together. I found that the W5 rib was a bit short, so I added a shim to make it fit. Cut two, 1/16-inch slots in W1 and one slot in W2 with a hacksaw blade. For step 36, make sure to sand the *bottom* of the LE, not the top, as stated in the manual.

After making sure that the joint at the root ribs of the wing halves fits well and that the dihedral braces fit solidly, I used 30-minute epoxy to join all of the root ribs, spars and dihedral braces. I completed the wing assembly by adding the remaining sheeting. I clamped the wing in place and let it dry.

You make the servo's rail supports out of die-cut 1/8x1/2x11-inch ply strips and the rails out of 1/4x3/8x36-inch basswood. The plans show you where to glue the rails and supports in each wing half. I glued in the basswood servo rails with medium CA, using a spare servo as a spacer. I glued Estes* BT20 rocket body tubes into each wing panel for servo lead guides.

Next, I sprayed the wing center sections with 3M adhesive and applied 3-inch-wide fiberglass tape. I brushed 30-minute epoxy that had been thinned with rubbing alcohol (by 25 percent) onto the fiberglass tape and squeegeed out the excess with toilet paper; this provided a clean center section.

I made the ailerons out of balsa sticks and sheeting, then glued them together with medium CA. I removed the ailerons from the plan and sanded them to shape.

FUSELAGE

I began the fuselage by gluing FD2 to F2 with medium CA, then laminated the three F1 firewall pieces with 30-minute epoxy. There are two identical die-cut fuselage sides. I marked one left and the other right, and I also marked the locations of formers IP, F5, F51 and F7 on the right fuselage side. Line up the left fuselage side with the right and transfer these marks. Formers F2, F3, F4 and F6 have notches in the fuselage for their locations. I glued balsa longerons to the fuselage sides with medium CA. Note that there is a specific measurement for each side. This helps set up the right thrust angle.

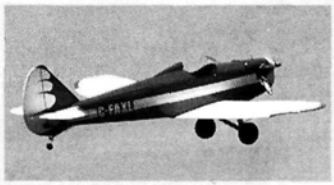
I glued the 1/8-inch, die-cut wing-saddle doublers and the bottom longerons into place with medium CA then added formers F2 and F3 to the left side. Use a triangle to be certain they are perpendicular to the fuselage side. Fit the right fuselage side and glue it to the left, making sure that the alignment is correct. I fit the 1/8-inch, die-cut ply-bottom deck into place, making sure that the shorter side was on the right. This procedure also helps create right thrust. I was satisfied with the fit, so I glued the deck into place with medium CA and glued the laminated firewall F1 into place with 30-minute epoxy.

I cut and fit the basswood doublers, then glued them in with 30-minute epoxy. For added strength, I drilled several 1/16-inch holes and epoxied in pieces of hardwood dowels. I built the remainder of the fuselage over the top view of the plans to keep the fuselage straight and square. I used a Sullivan* tailwheel assembly, so I had to modify the die-cut tailwheel bracket to make it fit.

FLIGHT PERFORMANCE

by Bob Joslyn

Before I fired up the O.S.* 120 Surpass, I made sure that all of the control throws were set up as advised in the construction manual. After adjusting the high-speed needle for best performance, I entered the runway and taxied into takeoff position. The Fly Baby's steering control is very good, with just a little rudder to compensate for any crosswind.



• TAKEOFF AND LANDING

I slowly advanced the throttle on takeoff, and the model started to roll. I added a small amount of right rudder to counter the engine torque and to maintain a straight path. After rotating and climbing to a safe altitude, I trimmed the Fly Baby for straight and level flight. The elevator was a bit sensitive and the ailerons were sluggish, so I added a couple of clicks of trim.

On landing, the Fly Baby handled as if it were on rails. The turns from downwind to base and final were solid. I carried a little bit of throttle until after it crossed the "numbers." Then I brought the throttle to idle and started the flare. The model settled onto the runway in a great 3-point landing. The rollout required some rudder to compensate for a slight crosswind.

• HIGH-SPEED PERFORMANCE

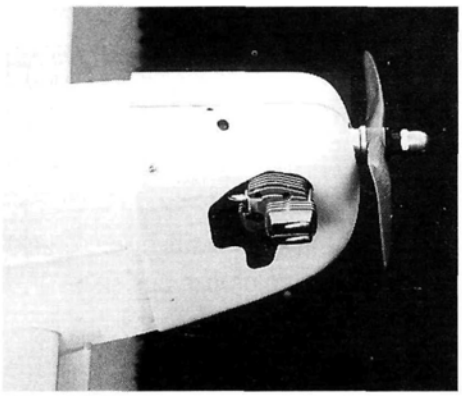
I did some high-speed passes down the runway centerline. Tracking was very good, and the controls were responsive.

• LOW-SPEED PERFORMANCE

Low-speed passes did not present any surprises. Again, the Fly Baby tracked well. I held a little bit of up-elevator to maintain level flight, and the ailerons still provided adequate control.

• AEROBATICS

To test the Fly Baby's stall capabilities, I first climbed to a safe altitude and then throttled back the engine to idle. As the model slowed, I kept adding up-elevator until the Fly Baby stalled. This maneuver was gentle, with a slight drop of the left wingtip. The rudder proved to be very effective in both right and left stalls. For loops, I entered from straight and level flight. The model went up and over in a nice round loop and had plenty of power with the O.S. 120 up front. Inverted flight required some down-elevator to maintain level flight, and I needed to work the ailerons a little to keep the wings level. The Fly Baby's axial rolls aren't the greatest; however, it will do some pretty impressive big barrel rolls.



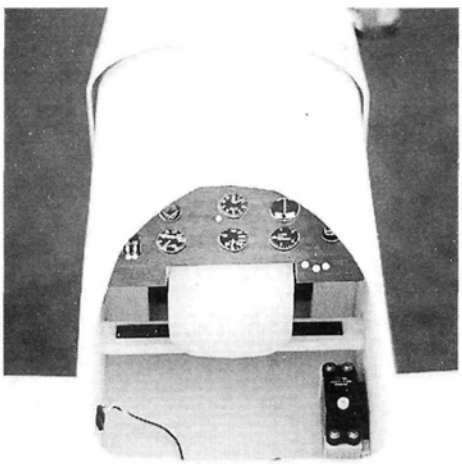
After drilling the necessary holes in the cowl, you should fill, sand and prime the cowl before painting it.

I glued the rest of the formers and the instrument panel into place with medium CA and sheeted the fuselage bottom from the wing saddle to the tail with 3/32-inch balsa. I installed all of the control-rod housings. I cut, fit and glued in the top ¼-inch balsa strings and sheeted the top of the fuselage from the firewall to F5A with ⅛x3-inch balsa sheet. I cut out the cockpit opening using the pattern from the plans and cut and fit the ⅛x¼-inch basswood stringers for the rear turtle deck. I glued the plywood wing-mount blocks into place with 30-minute epoxy. I reinforced these blocks in the fuselage with scrap basswood and added two ⅛x¼-inch balsa stringers to the fuselage sides to give the plane a more rounded shape. Last, I sanded the entire fuselage and set it aside.

FINAL ASSEMBLY

You'll need to shape some tail-fairing blocks before mounting the fin and stab to the fuselage. I used scrap wood of the proper thickness for shim blocks. Tack-glue the fairing blocks to these shims then carve and sand them to shape. I then fit the wing to the wing saddle in the fuselage; this must be done before you glue the fin and stab into position. After a trial-fit, I epoxied ¼-inch hardwood dowels into the holes in the wing and fuselage with 6-minute epoxy.

True up the wing to the fuselage, then locate, drill and tap the wing-mount bolt holes. I finished the wing-mount holes with 1/16-inch-ply wing-bolt plates, then glued in the basswood landing-gear block with 30-minute epoxy, making sure it was firmly attached to former F2. I sheeted the bottom of the nose from the landing gear block to the firewall with ¼-inch plywood and 30-minute epoxy and remounted the wing. Use a fairing block to blend the wing to the fuselage. Then I glued the stab and fin into place with 30-minute epoxy.



Dynaflite also offers a scale cockpit kit for your Fly Baby to enhance its already great looks.

To make the landing gear, I used a high-watt soldering iron and silver solder. I added the basswood airfoil fairings using thin CA and fiberglassed the fairings to the wire. Finally, I filled, sanded, primed and painted the gear with 21st Century dark red paint. I installed the engine and fit the plastic cowl. After all the holes in the cowl have been cut, finish and paint it in the same manner.

FINISHING

Before applying the paint, I covered my Fly Baby with 21st Century* white fabric. I made the windscreen and attached it with screws. I installed all servos and control rods as stated in the manual, but I positioned an EMS* 1200 battery pack and Hitec RCD* receiver to obtain the proper center of gravity (CG). I set up all of the control throws as recommended. I used Hitec's HS-545B servos on all flight controls and a JR* NES-L501 servo for the throttle control.

CONCLUSION

I found the Dynaflite Fly Baby to be a good choice for a first IMAA-size model. It requires some building skill, so I don't recommend it as a first-time kit. The high-quality, die-cut parts and good manual make this kit a nice one. If you have some skill with building and flying, its handling characteristics will suit you well.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

SR

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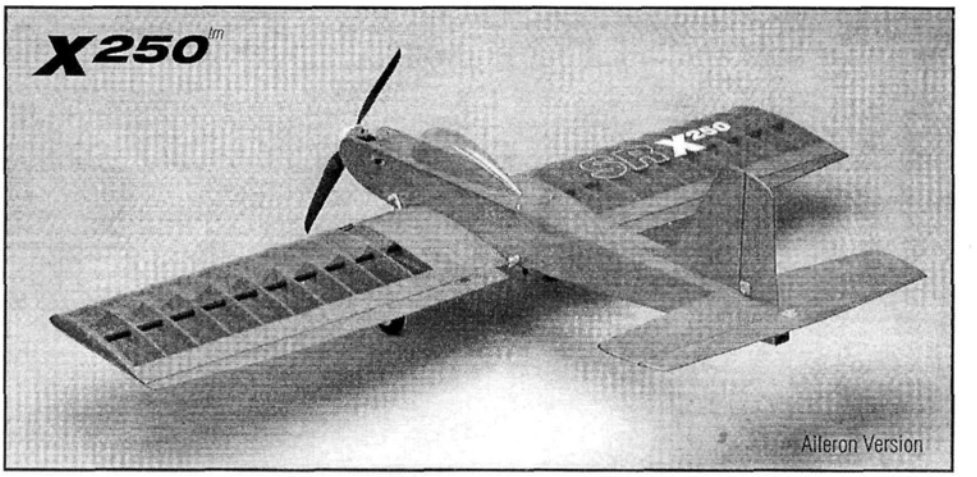
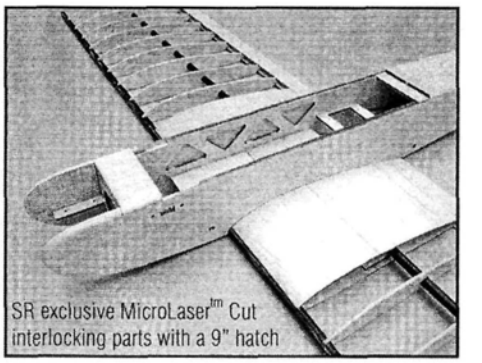
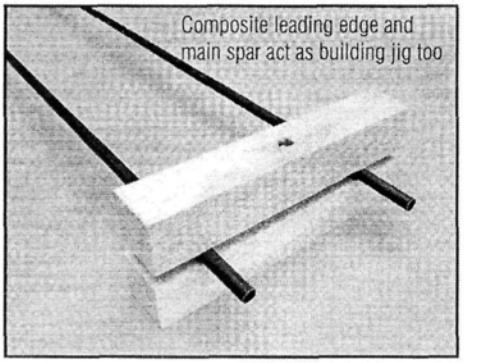
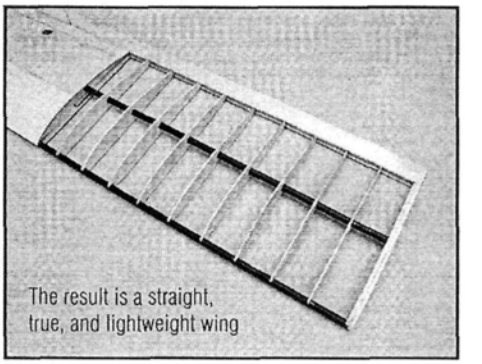
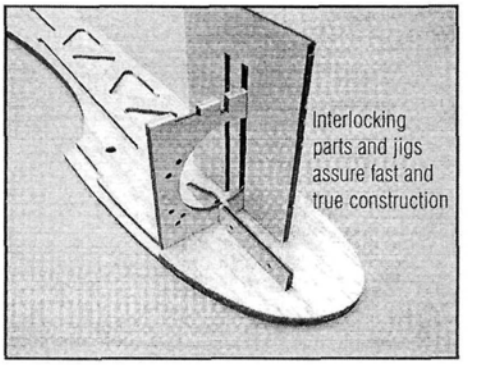
Please give us a call at 516-286-0079 or visit our web site www.srbatteries.com for more details.

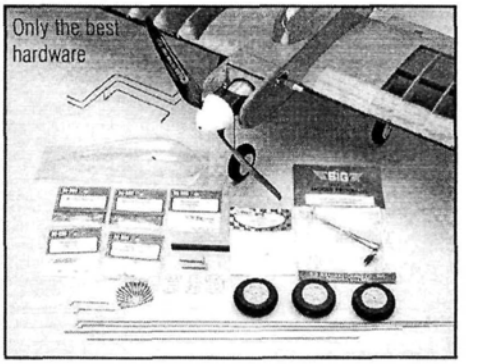










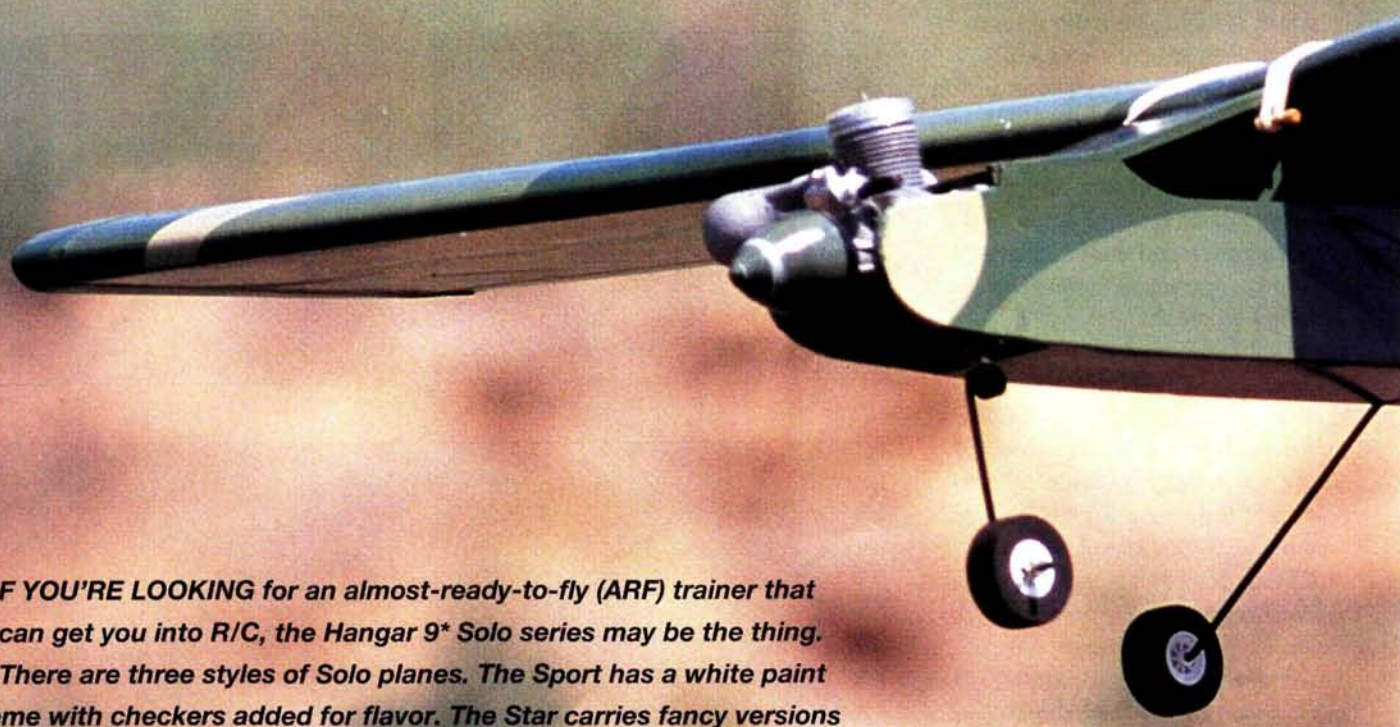


SR Batteries, Inc., Box 287, Bellport, New York 11713
Phone: 516-286-0079, Fax: 516-286-0901, Email: info@srbatteries.com , Web Site: www.srbatteries.com

Hangar 9 Solo Strike

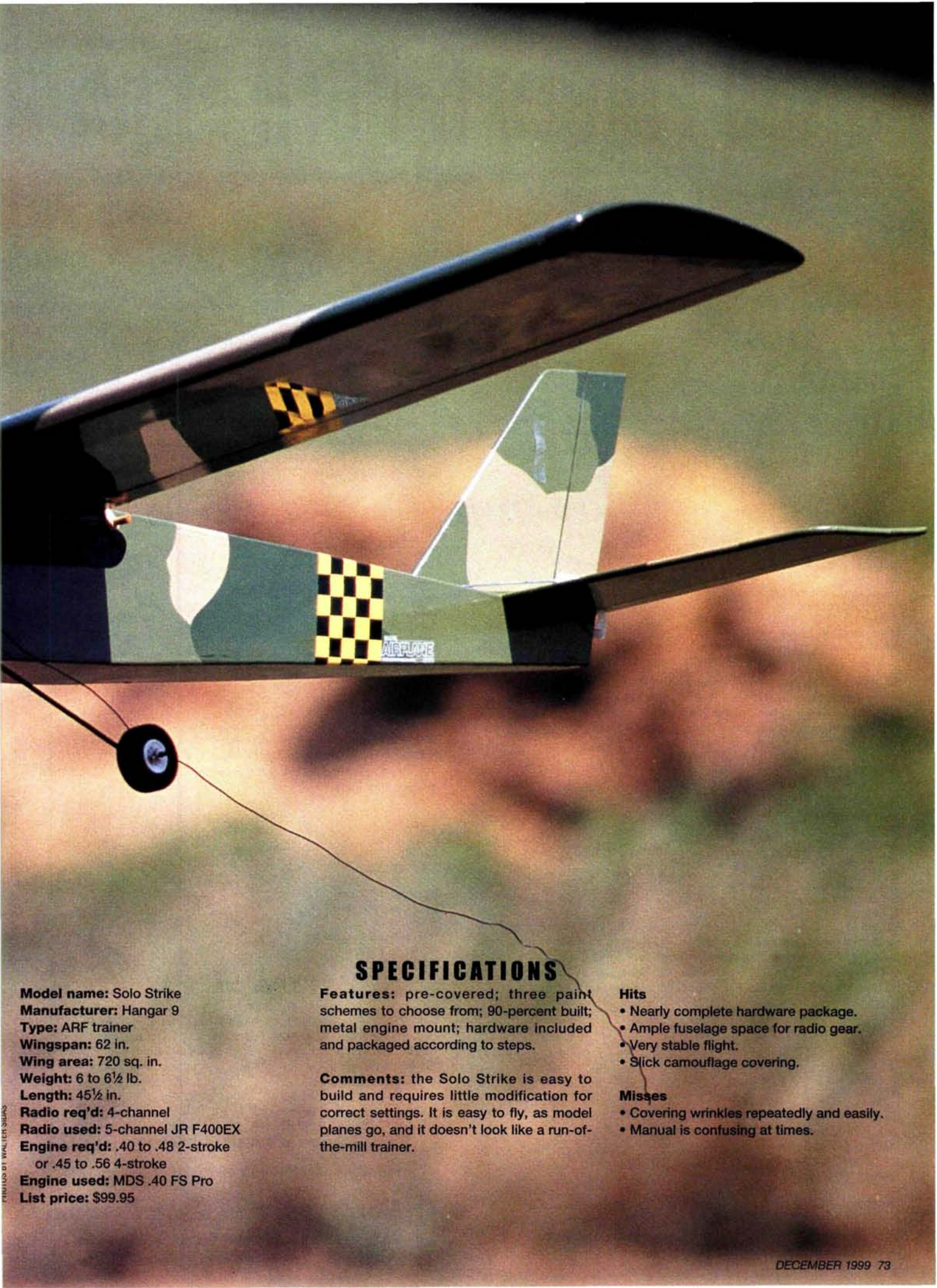
The commando of the ARF Value Series

by Geoff Cozine



IF YOU'RE LOOKING for an almost-ready-to-fly (ARF) trainer that can get you into R/C, the Hangar 9* Solo series may be the thing. There are three styles of Solo planes. The Sport has a white paint scheme with checkers added for flavor. The Star carries fancy versions of the Stars and Bars. Personally, I like camouflage, so I got the Strike, deciding that character was more important than high visibility.

Being a newcomer to R/C aircraft, I didn't know what to expect. I needed an easy-to-build plane to learn how to fly with, and I needed the accessories that would get me going. The Solo Strike was what I was looking for, especially when combined with Hangar 9's SkyPack. The SkyPack includes a JR 5-channel F400EX radio with four JR 517 ball-bearing servos; Sanyo rechargeable Ni-Cds and charger for the transmitter and receiver; an MDS .40 FS Pro engine; a manual fuel pump; a chicken stick; a glow-plug wrench, a starter and charger with two glow plugs; a bottle of fuel and a Master Airscrew 10x6 propeller. With the Strike kit and the SkyPack, all I needed was 10 hours of building time, and I was ready.



SPECIFICATIONS

Model name: Solo Strike
Manufacturer: Hangar 9
Type: ARF trainer
Wingspan: 62 in.
Wing area: 720 sq. in.
Weight: 6 to 6½ lb.
Length: 45½ in.
Radio req'd: 4-channel
Radio used: 5-channel JR F400EX
Engine req'd: .40 to .48 2-stroke or .45 to .56 4-stroke
Engine used: MDS .40 FS Pro
List price: $99.95

Features: pre-covered; three paint schemes to choose from; 90-percent built; metal engine mount; hardware included and packaged according to steps.

Comments: the Solo Strike is easy to build and requires little modification for correct settings. It is easy to fly, as model planes go, and it doesn't look like a run-of-the-mill trainer.

Hits
- Nearly complete hardware package.
- Ample fuselage space for radio gear.
- Very stable flight.
- Slick camouflage covering.

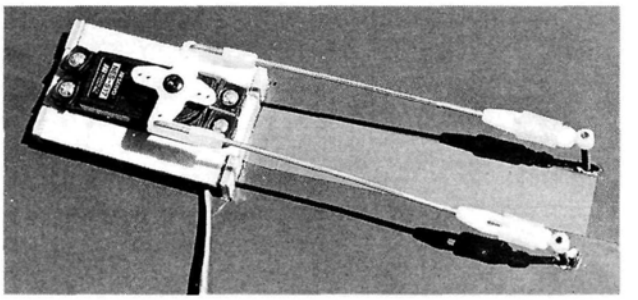
Misses
- Covering wrinkles repeatedly and easily.
- Manual is confusing at times.

PHOTOS BY WALTER SIUAS

THE KIT

The fuselage, wing halves, stab and fin come in plastic bags and need only to be glued together. In separate bags, divided to coincide with the various stages, were the fuel tank with accessories; spinner; landing gear; a plastic parts tree containing clevises, control horns, etc.; and a bag of hardware. The covering is very prone to wrinkling, so I picked up a heat gun, too. If you have a clean, flat surface to work on, all you'll need are the basic modeling tools, i.e., a drill, a motor tool, a set of screwdrivers, epoxy and CA glue, fuel tubing and receiver foam. Check the manual's "needed tools" list, and you're ready.

Above: the Hangar 9 SkyPack is an excellent companion to your Solo kit. It contains everything you need to get into the air except the tools and glue.



Right: installing the servo-tray supports before you install the tray itself will ease construction, and pushrod keepers make fragile Z-bends unnecessary.

THE WING

The first step is mounting the ailerons on the wing halves. You first clean out the hinge slots; this can be done with a hobby knife, although I found a toothpick easier to use for this because it didn't cut the wood. The hinges should fit easily but not loosely. I used Pacer* PT-55 Maximum Strength Hinge Glue to attach the hinges.

Next, glue the pieces of the dihedral brace together. They don't need to match perfectly, but the brace should slide into the slots with relative ease. Mark the brace centerline, and mark where the aileron servo tray will go. I checked the dihedral angle and found it right on. Use a slow-curing epoxy for these high-stress connections; I used Anchor Bond* 20-40 epoxy.

The manual recommends that you mix 3 ounces of epoxy to join the wing halves. I mixed only 1 ounce and still threw more than half of it out. Use your judgment as to how much epoxy is needed or you'll waste it.

When the wing is dry, attach the aileron servo tray. I installed the supports and then added the tray, instead of making the tray and then gluing it in. Last, apply the strip of covering tape that is included with the kit; it neatly matched the covering on the top of the wing.

Now mark and drill the holes in the servo tray because if you wait until it's installed, you'll have difficulties fitting your drill into the fuselage without marring the wood. To ensure free aileron movement, I would also make sure that the ailerons don't catch on the plastic wingtips.

THE FIN AND STAB

For the rudder and elevator, simply clean out and epoxy the hinges, then cut away the excess covering so you get a good wood-to-wood epoxying surface. (Cut inside your line, so bare wood doesn't show after assembly.) I tested the position of the stab and rudder and found their angles nearly perfect.

I had problems attaching the servo horns. The kit gives you three sets of four screws and does not differentiate between them. I used the longer screws with the larger threads to attach the control horns but soon discovered that they were for the landing gear. There was no damage because of this error, and the correct, finer-thread screws went in fine. Installing the rudder horn parallel to the line of flight and *not* perpendicular to the hinge line will help you avoid having control slop.

THE FUSELAGE

When you're supposed to cut holes in the covering for the wing dowels, note that the holes in the balsa are larger than the dowels. I traced around the dowel on one side to make a guide. After I had cut the first hole, I passed the dowel through and pushed it against the covering (and my finger) on the other side; this gave me a guide for the other hole. If you cut out all of the covering over the hole, you'll end up with a gap. If you do get a gap, fill it in with epoxy when you fuelproof the dowel, and use paint, marker, or tape to make the epoxy match the plane's covering.

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

With the addition of a little right rudder, the Solo Strike tracked straight down the runway and lifted off when it was about 80 feet into the takeoff roll. During the climb-out, I pitched the nose up about 20 degrees and the model handled this angle of attack (AoA) without stalling.

Landing presented no problems, as it tracks well during the final approach, and it can be landed at an incredibly low speed. You control the descent rate with the throttle and the airspeed with the elevator. There is plenty of aileron and rudder authority to counteract any crosswind the model might encounter.

• LOW-SPEED PERFORMANCE

With a relatively high AoA and a low throttle setting, the Solo Strike will fly at about 5mph. I was able to do tight figure-8s—at a very low speed, right in front of me—and the plane never dropped a wing or stalled out. When it does stall, it gently falls forward; if you let go of the stick, it starts to fly again.

• HIGH-SPEED PERFORMANCE

The Solo Strike can zip along at a fairly fast clip with plenty of speed to accomplish any type of basic maneuver. At its highest speed, it tracked well and required some right aileron trim to maintain wings-level flight.

• AEROBATICS

All of the basic maneuvers are in the Solo Strike's repertoire and require only that the pilot knows how to do them. The roll rate is faster when rudder is added; to recover from a spin, let go of the sticks to stop the rotation, then pull on the elevator stick to recover to wings-level flight. With a little right rudder added, it tracked well in the loop and did not fall off to one side. A little down-elevator was required to maintain inverted flight.

All in all, it is a good trainer aircraft, and it is extremely easy to fly.

When installing the fuel-tank assembly, I intended to use the aluminum tube, but it kinked when I bent it. I tried to remove the kink and accidentally broke the tube. I replaced the aluminum with stronger brass ones. I also recommend the Du-Bro* Tubing Bender. The amount of hassle and stress that this little tool will save you is well worth its price.

On inserting the tank into the firewall, the manual was clear, as it is for most of the steps, with one exception. There is a picture of the installed tank viewed from the front of the plane; this doesn't allow you to see how far the tank goes into the firewall, so I was confused about how far it should be pushed in.

For the main landing gear, I would either wait to fuelproof the exposed wood until after the gear has been installed, or I'd be sure to use thinned epoxy or very little of it. I used non-thinned epoxy and put on too much, and that made it difficult to fit the landing gear. It took time to clear out the groove enough to fit the landing gear in nicely.

THE ENGINE AND PROP

The engine and prop installations are easy. Simply clamp the engine into place. Also, twisting the engine slightly to the right as viewed from the tail will counteract the engine's torque.

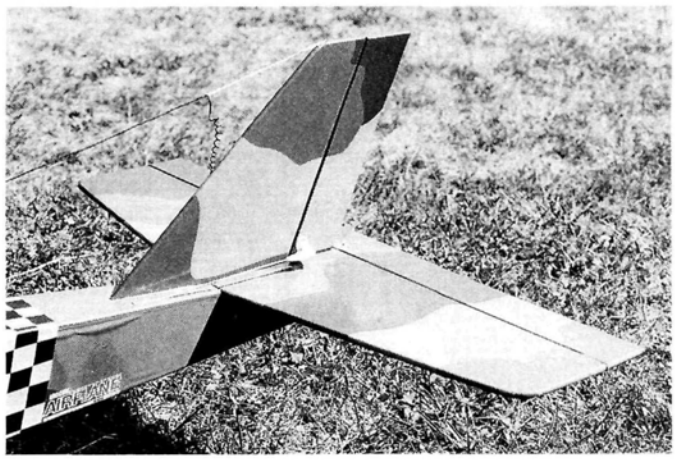
THE RADIO AND LINKAGES

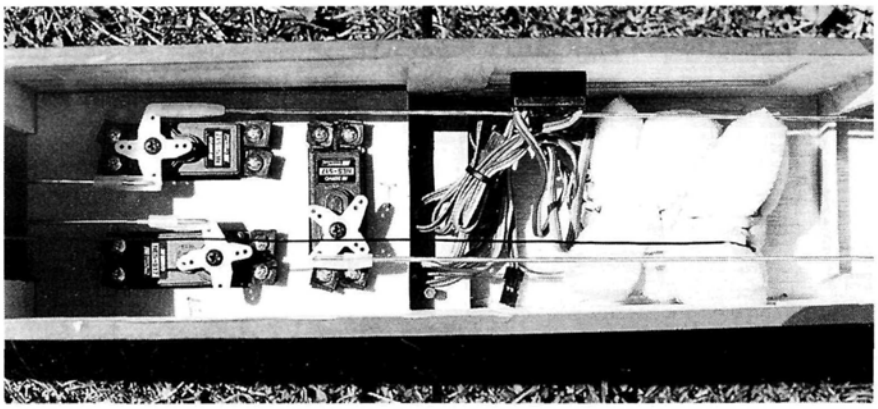
When installing the electronics, remember to put the switch on the side of the plane that the muffler is *not* on. Also, unlike the manual's suggestion, the battery and receiver should be separated so that your receiver has a greater chance of survival during a crash. The CG will be too far forward unless you nestle your battery pack in the tail. To mount the receiver, put a piece of Velcro®-brand fastener or hook-and-loop tape on the receiver foam, wrap the receiver, and stick it where the manual indicates. For the battery, tie a small piece of string around the plug between the wires to prevent the plug from opening during flight. Then, nestle the battery in a piece of ½-inch-thick foam with ¼-inch-thick foam on top and underneath, rubber-band the layers together, and put the battery into the tail, leaving only a little slack in the wire. The thicker foam helps to wedge the pack in place. Your CG should be correct if you follow these steps.

For the linkages, put pieces of tubing on the clevises to prevent them from opening, but to ease installation, use less than the manual suggests. Z-bends are difficult to make, and they severely weaken the rods, so use pushrod keepers instead of Z-bends for all of the control-rod connections, except for the steering, where the keeper doesn't fit through the firewall.

When you connect the control rods to the pushrods for the stab and fin controls, it's fine to use the included shrink-wrap, but for added strength, I recommend CA and an accelerator such as Pacer PT-15 Zip Kicker along with sewing thread or string for the pushrod/control-rod connection. (I hope my fiancee won't find out that I learned that the string from our ironing-board cover works very well.) I placed one end of the string on the rod, glued and kicked it, then wound it tightly around the connection. Once you've covered the rod/dowel connection with string, douse it in CA and kick it, and you'll have a bond that's much stronger than the wood itself.

I did not use a pushrod keeper on the steering rod because the keeper doesn't fit through the hole in the firewall. Instead, try using an easy connector. This will not only make aligning the rudder and wheel much easier, but it will also save you the hassle of trying to put a Z-bend in a rod that is almost completely hidden between the fuselage wall and the engine.

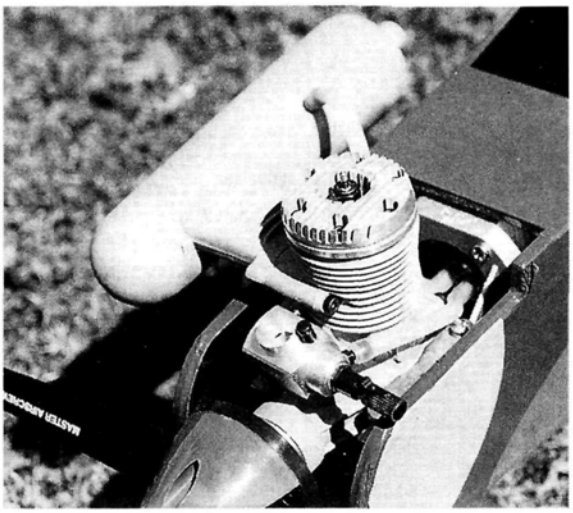




Above: to eliminate control slop, install the control horns parallel with the line of flight, not perpendicular to the rudder hinge. Using a "u" from a paper clip and a slip-knotted rubber band, you can form a convenient antenna keeper that will give way in a hard landing.

Left: drilling the servo holes before you glue the tray in will make installation easier. Putting your receiver and battery together increases the possibility of your receiver being damaged during a mishap, so move the battery to the tail. This will give you the correct CG, too.

Below: clamp the engine onto the engine mount, and don't forget to turn the engine slightly to the right (looking from the tail) to counteract the inevitable engine torque.



CONCLUSION

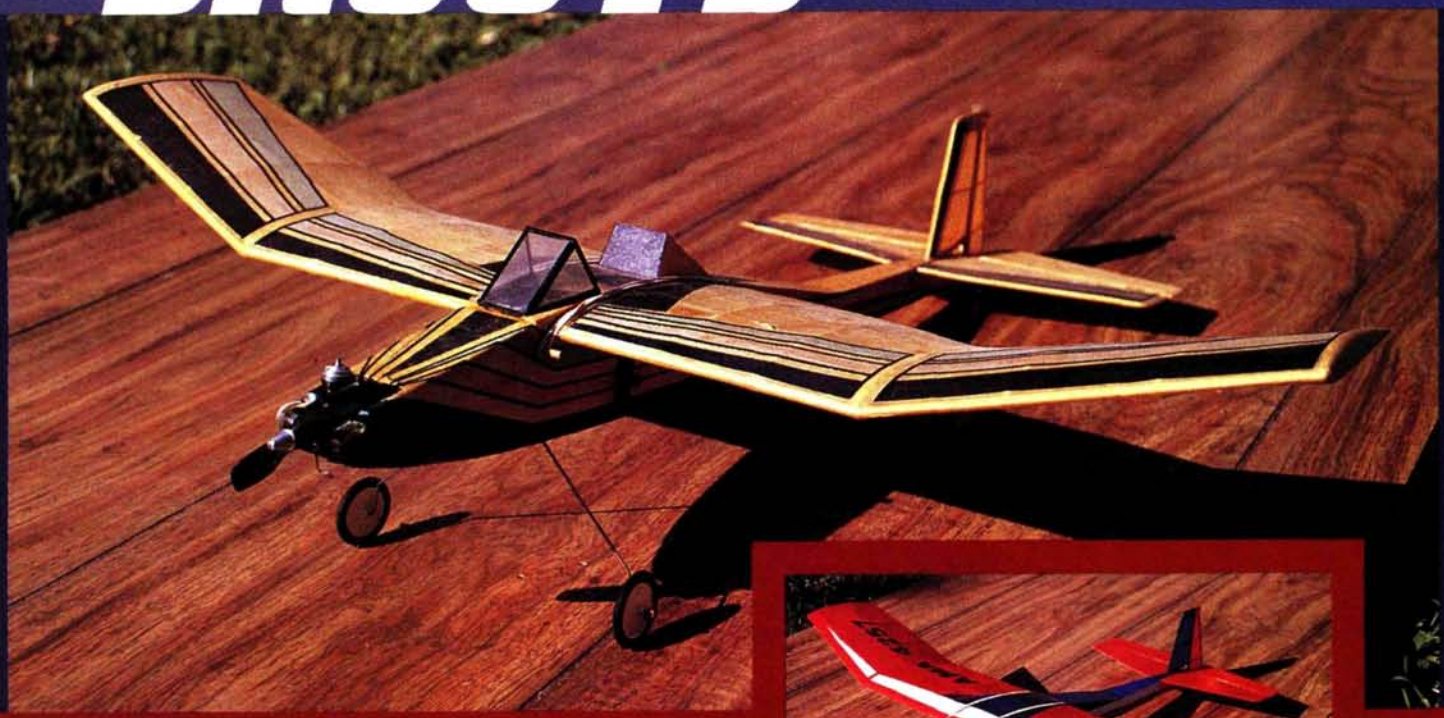
I found this kit very easy to build. If you build this kit—or any other kit, for that matter—I strongly recommend a few useful aftermarket items, such as the Tubing Benders. The manual is a little "fuzzy" in some areas, but the overall ease of construction and the good quality of the kit offset this, and you can't beat the camouflage covering. The Strike also has very stable flight characteristics. All in all, this plane proved itself to be a nice first ARF for any modeler.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

by Jesse Shepherd Sr.

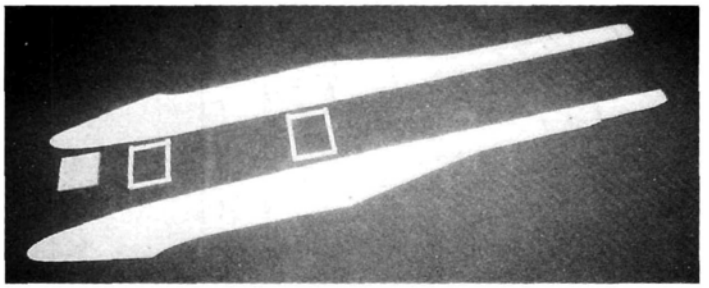
SKOOTS

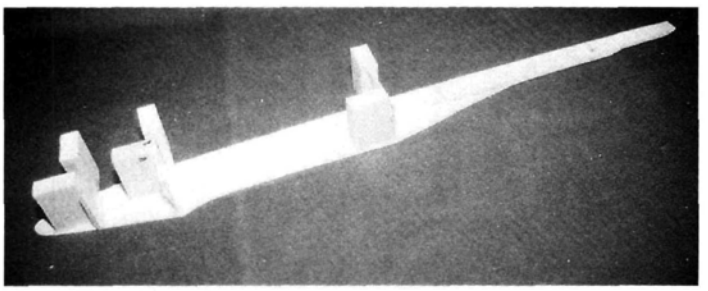
3-in-1 backyard flyer for glow or electric power

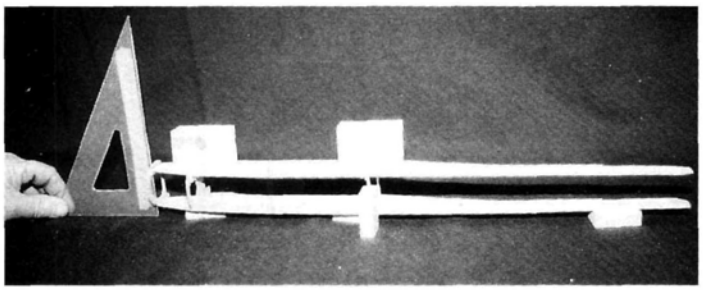


PHOTOS BY JESSE SHEPHERD SR.

THE SKOOTS IS AN R/C version of my rubber-powered Skooter but is twice its size. Because I wanted a Cox* TD .010-powered model for the Little Rock Small Steps Fun Fly, I enlarged my popular Skooter plans. When Randy Randolph test-flew the model, he said, "It really scoots!" So "Skoots" became its name!







SPECIFICATIONS

Model: Skoots (Electro-Skoots)

Type: ½A sport monoplane

Wingspan: 24 in. (31 in. electric version)

Wing area: 129 sq. in. (156 sq. in. electric version)

Weight: 6.5 oz. (9 oz. electric version)

Wing loading: 7.26 oz./sq. ft. (10.05 oz./sq. ft. electric version)

Length: 23.5 in.

Engine range: .010 to .020 (4-cell electric optional)

Radio req'd: 2-channel (rudder and elevator; 3-channel with speed control for electric version)

Comments: designed by Jesse Shepherd Sr., the Skoots is a fun and relatively easy-to-build, lightweight ½A-powered backyard flier. The plans show details for a .010, a .020 and a 4-cell electric-powered version. The electric-powered Electro Skoots has a larger wing that's shown on page 2 of the plans. Lightweight covering material such as Japanese tissue is recommended.

Top: there are just a few fuselage parts for the ½A version of the Skoots. Mark the locations of the formers and sticks on the inside of the fuse sides. Center: position the left side on a level surface and glue on the formers using squared alignment blocks to support them and keep them vertical while they dry. Bottom: align the left side over the right side and glue the formers to the matching locations on the right side using alignment blocks and weights to hold the assembly in position. (For all options; Electro-Skoots shown.)

The Skoots presented here is ideal for .010 engines, and with the much lighter R/C units now available, a 5-ounce flying weight is possible. I have included details for a Cox TD .020 installation and drawings for a low-watt electric motor-powered Electro-Skoots version because they have become very popular. The Electro Skoots has a 31-inch span and weighs about 9 ounces.

Choose the Skoots you want to build, study the instructions given here and the plans, and cut out all the parts you'll need. Maybe you'll want to build all three versions!

FUSELAGE

Construct fuselage frames 1 and 2 over the plan and set them aside to dry. Use the 1¼-inch-wide frames for the .010-powered model and the 1⅜-inch-wide frame for the .020-powered model. Hand-pick the lightest, 1/20- or 1/16x3x36-inch balsa wood you can find, and "strip" off three square strips for the corners and internal structure. The 1/20-inch-thick wood is 20 percent lighter than 1/16-inch wood and is strong enough to do the job. Now cut out the sides and doublers from the remaining sheet (see patterns on sheet 2).

Sand both sides together to match the plan, then drill two 1/16-inch pilot holes through the sides for the wing hold-down dowels and one for the plastic pushrod-guide exit. Mark where all the internal structures will go on the left and right sides, then glue on the corner strips, the tail mount and other structural strips (verticals and diagonals.) Check all the doublers for fit, and glue them into place. Enlarge the holes with a 3/32-inch drill bit; then, using 90-degree triangles or "squared-off" wooden blocks to keep them square, glue frames 1 and 2 onto the left side. When the glue is dry, glue the left side assembly to the right and taper the aft inside ends of the sides; align the fuselage sides over the plan centerline and glue and clamp them together.

Glue the firewall into place, followed by the ply backup strips, the cross-strips, the nose block and the cowl bottom. Trim the ply landing-gear mount and backup strips to fit, and glue them into place behind frame 1 and flush with the bottom. Elongate the pushrod-guide holes and glue the 3/32-inch o.d. plastic guides into place. Next, drill the screw pilot holes in the firewall, gear mount and their backup strips, and install the landing-gear clamp plate with four, ¼-inch-long no. 2 round-head wood screws.

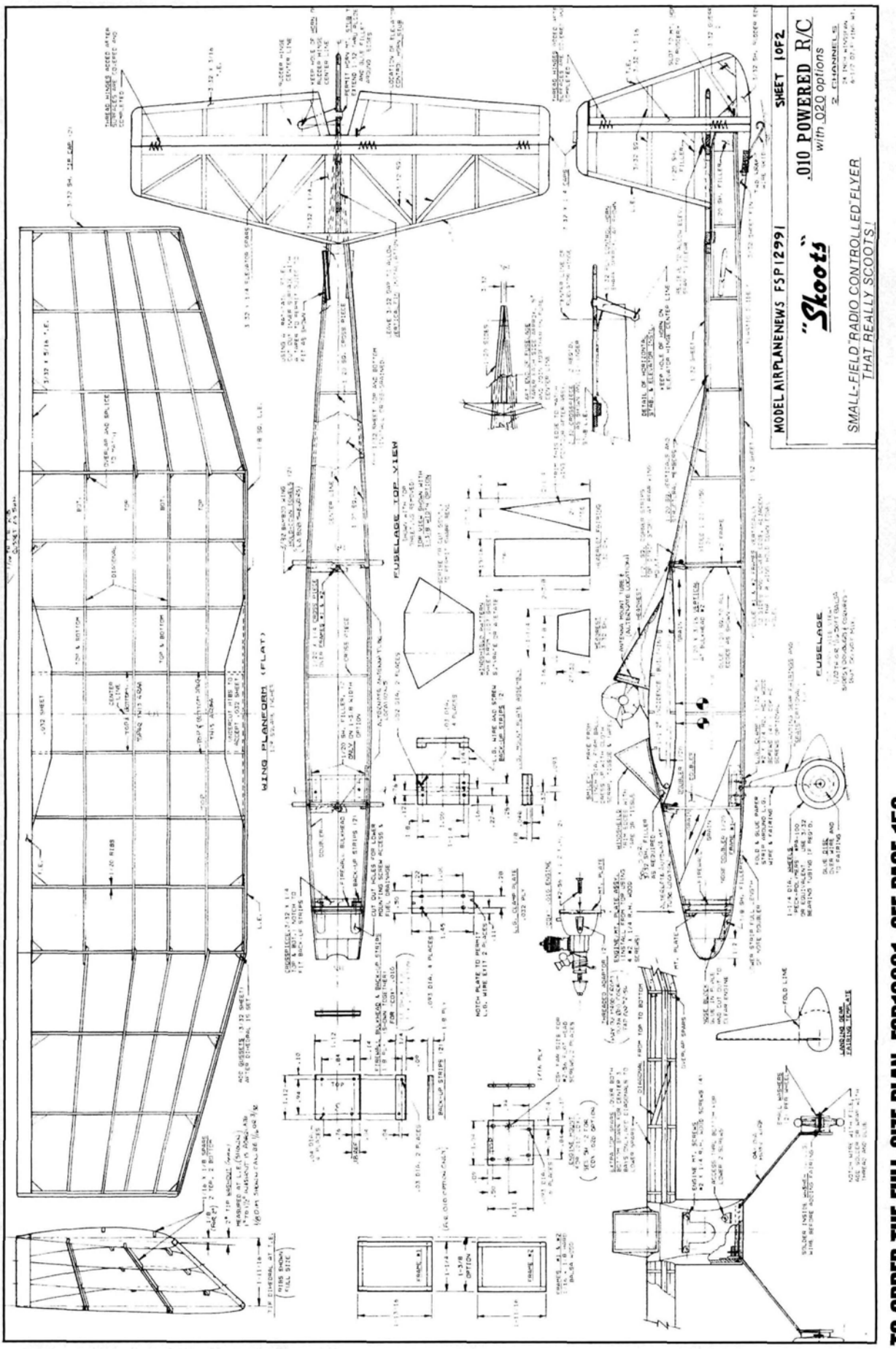
Leaving a little extra wood hanging over the sides, glue on the top and bottom cross-grained planking. Moisten the wood to make it easier to bend as you continue planking around the nose. Do not glue planking onto the landing-gear clamp plate. Sand the planking edges flush with the sides.

Temporarily attach the engine to its mount, and carve the cowl opening and nose block until the engine mount, engine, needle valve and fuel tubing clear the cowl completely. Remove the engine from the mount, cut the fuel drainage slots, and liberally fuelproof the landing-gear-mount plate and engine compartment.

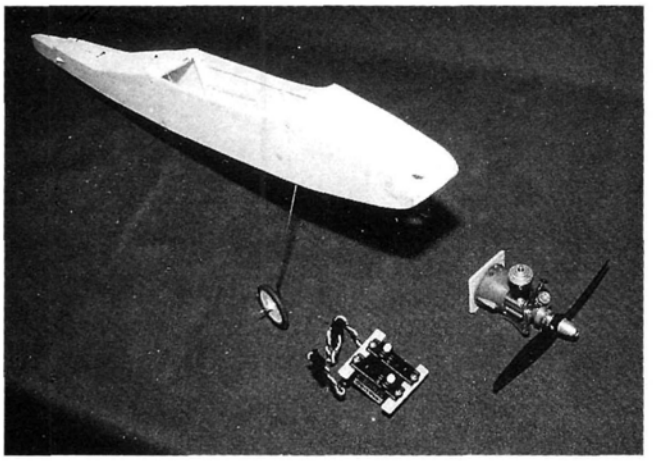
WING ASSEMBLY

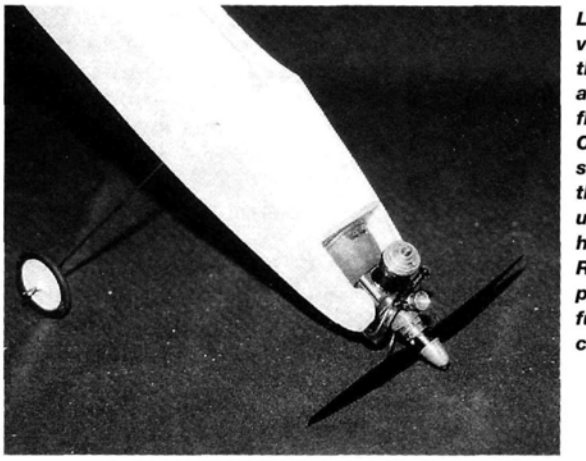
Cut a sheet of 1/20- or 1/16x3x36-inch lightweight balsa into 14, 1x6-inch blanks. Stack and pin the blanks together, then cut and sand them to the center-section rib-pattern outline. Separate the tip ribs to be notched later. Cut the top spar notches across the center ribs as shown on the plan, then cut and sand each pair of tip ribs to match their patterns shown on the wing's end view. Now cut in all leading edge (LE) notches.

Cover the wing plan with clear kitchen wrap, and position the trailing edge (TE) and LE on the plan, leaving them extra-long on the ends. Place the ribs on the plan. Cut 1/32 inch off the top of the two center ribs for the front and rear ½-inch,



TO ORDER THE FULL-SIZE PLAN, FSP12991, SEE PAGE 152.



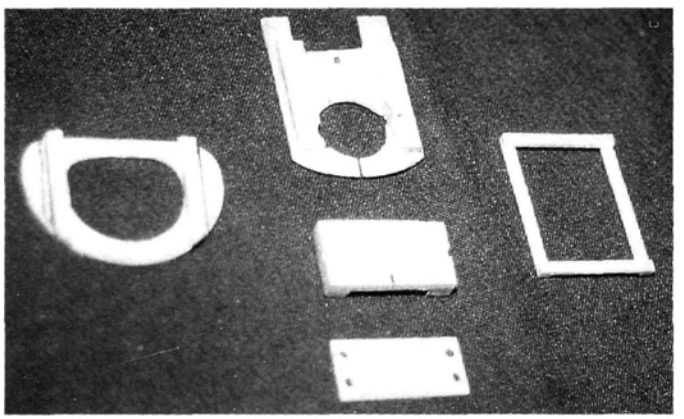


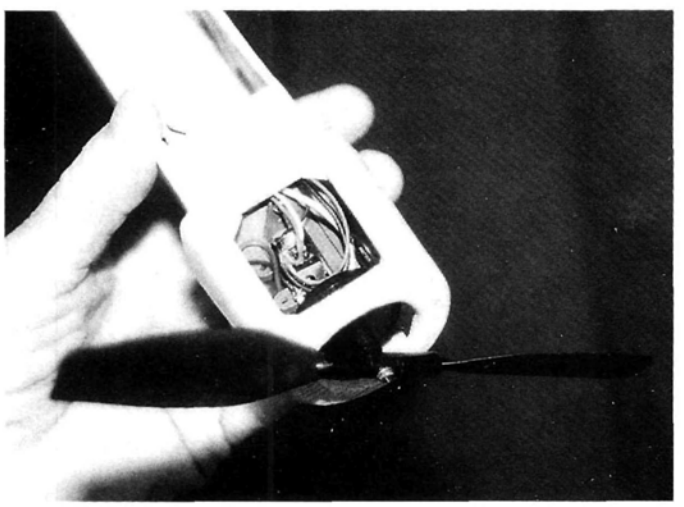
Left: for the 1/2A version only: plank the top and bottom, and sand the edges flush with the sides. Cut away the cowl structure to clear the engine assembly until the mounting holes line up. Right: the 1/2A-powered Skoots fuselage, ready to cover.

center, filler caps. Position and glue each rib on the TE and the two lower spars, using shims to keep the spars flush with each rib. Using weights or pins, hold down and glue the LE to the rib notches. Glue the two top spars into place, followed by the 1/32x1/2-inch center-section caps, and leave the center section pinned to the board.

Cut the center-section LE and TE flush with the end ribs, and leave the center-section spars long enough to splice with the outer wing-panel spars. While holding the tip panels in the proper dihedral and washout positions, cut the tip LE and TE ends to fit the dihedral joints. Block up, pin and glue on the tip sections (1/16-inch to 3/32-inch washout is adequate). Now, notch the ribs for the top spars, then cut and splice the spars for a good overlap joint, and glue the tips into place. Glue in all the rib gussets and let them dry.

Remove the wing from the plan, add the lower tip spars and splice them as you did for the top. Make notches for and then add the auxiliary top spars as shown. Sand the tips of the spars flush with the tip rib, add the caps for the tip ribs, then sand and round them off to match the tip contour. Using a flat sanding bar, sand everything smooth, shape the LE and set the wing aside for covering.





Above: here are the optional Electro-Skoots fuselage parts. Construction details are on page 2 of the plans. Below: here, the Selman speed-control unit and motor-mount housing have been installed. Remove for covering, then reinstall as shown.

TAIL SURFACES

The tail feathers have 3/32-inch-square ribs and LEs, 3/32x3/16-inch vertical posts and 3/32x1/4-inch horizontal spars and caps. Build the tail surfaces over the plan, then round off all the corners, except where parts will be glued to the model. (Hinged areas must be rounded.) Sand the surfaces smooth for covering, but do not hinge them until they have been covered.

FINAL ASSEMBLY

Prepare and cover all the parts except the stab mount, and add your color trim. The only iron-on covering I recommend is Micafilm*; I also recommend Japanese (not domestic) tissue for the wing and tail surfaces, as it is the lightest and is adequately strong. Use dope to fuelproof all surfaces.

Hinge the control surfaces with matching colored thread by sewing the parts together in a figure-8 configuration using two threads per pass as shown on the plans. (First drill small holes through the spars to allow the needle to pass through.) Glue the thread only at the holes, using any glue but CA. Cut a slot in the rudder and elevator for the control horns, and glue the control horns so the holes in them line up with the hinge lines. When the glue has dried, paint the horns to match.

Remove the covering from the area to be glued, and align the stabilizer with the wing mount, ensuring that it's square with the body. Make sure the elevator hinge line clears the end of the fuselage. Line up the vertical-fin slot with the fuselage centerline, and glue the stab into place. Remove the slot covering and glue the vertical fin and fin post to the end of the fuse. Make sure all the parts are square. Cut out the lower fin to match the body and fin post, install the wire tail skid, bind with thread and coat with glue; cover and glue into place.

Install the engine and mount with four, 5/16-inch long no. 2 wood screws. Slit the covering on the sides and aft edge of the landing-gear-clamp plate, leaving the front edge as a hinge. Insert the gear-wire stubs through the holes in the gear-wire mount, and cut notches in the plate for the gear. After fitting the gear into place, secure it with the wood screws. Install the 1 1/4-inch-diameter wheels, the wheel bearings and the 1/64-inch ply gear fairings as shown on the plan.

COCKPIT DETAILS

The filler in front of the wing is glued to the LE and shaped to slide forward on impact. It may be solid or built up with wood pieces and finished with a matching covering. The cockpit details are mounted on a removable wing protector (see sheet 2). Cut the wing protector to size and fit it under the wing-hold-down rubber bands.

The windshield pattern is shown on the plan; cut and fold the windshield material to shape and outline the panels with tape. Make the headrest as shown, and glue on the protector as shown. Smiley the pilot was made with a foam ball and has a cardstock-and-paper cap. He's glued to the headrest.

EQUIPMENT INSTALLATION

I control the Skoots with the Hitec* 555 RX, and Cirrus* CS-20BB sub-microservos. Depending on the number of flights you want to make without charging, use a 110 to 220mAh battery pack. Remove the servos' arms and mount the servos (splines facing forward) on the 1/16x1/4-inch plywood mounts. Glue 1/8-inch-square, 2-inch-long rails to the fuselage sides from frame 2 forward, then glue the plywood mounts and the servos into place. (If you prefer, use servo-mounting tape.) Bend the ends of the 1/32-inch wire pushrods into Z-bends, and twist the top leg 90 degrees to the side. Ensure that the Z-bends match the horn holes. Leave 2 inches of wire on each pushrod so you'll be able to insert them into the guide tubes and connect them to the horns. Wrap the battery pack and receiver (RX) with foam, and place more foam in the nose with the RX pack up against it. Move the radio gear around until the model balances as indicated on the plan (two inches aft of the front wing hold-down dowel for "groovy" response and 2½ inches aft for stunt flying).

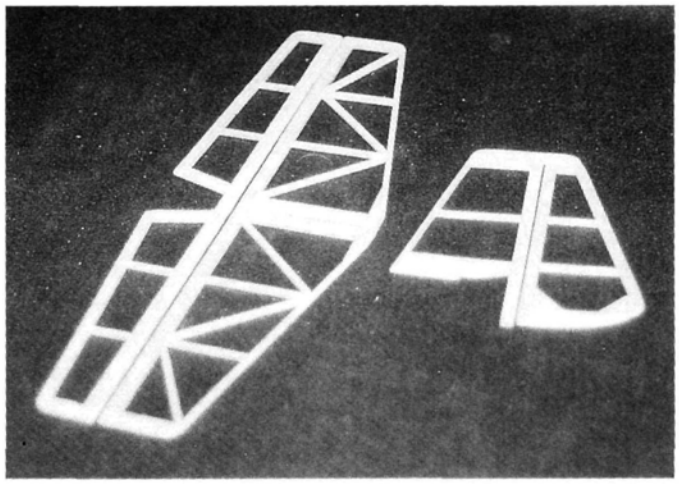
With a friend, range-check your R/C equipment with the transmitter antenna down; the rudder and elevator should move 3/8 inch in either direction without binding.

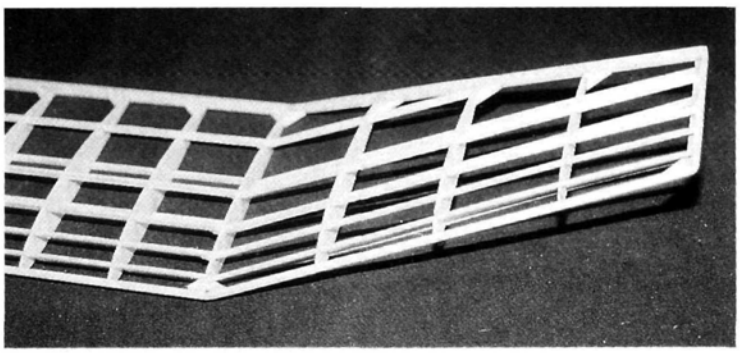
ELECTRO-SKOOTS

The Electro-Skoots is the last of the Skoots trio.

Sheet 2 of the plan shows the differences: a larger wing and a modified nose for the low-watt motor. The plans show the Knight & Pridham (K&P)* 02 motor that uses 4 cells. Many other motors would work well, and many combinations of batteries could be used with good results.

The nose has to be modified to accept the motor as shown in the sheet 2 details; it uses a "flow-through" cowl for motor cooling. Add the 1/64-inch ply reinforced "half-moon" air exit to the nose sides, and add the 1/8-inch strips to the nose edges as shown. Use the same body assembly procedure as for the engine-powered version, but don't use frame 1.





Above: the tail feathers are typical stick-built structures. Sewn hinges are used on the original model. Left: the wing has dihedral outer wing panels added to a flat center panel. A larger wing is shown on the plans for the electric-powered version.

Glue on the 1/8x3/8-inch lower cowl support. Re-sand the nose and support ring and trial-wrap the cowl around the nose; trim the cowl as needed. Moisten the cowl surface to help bend it tightly around the top corners. When the cowl wrap fits the ring, corners and nose ring, glue into place, starting at the lower centerline and finishing at the hatch centerline.

Add the hatch cover, limit tabs and supports, and glue on the U-shaped spring hatch lock. Remove the ring gear from the motor, slide the motor through the hatch shaft and attach it loosely only with the top screw. Install the ring gear on the shaft that goes through the front opening. Make two lower mounting-screw access holes in the bottom of the cowl.

I used a tiny Selman* speed-control unit mounted on top of the motor; it fits and functions great. Route the power wiring and connect the power connector. Use hot wax to secure the wiring to the motor housing, away from the lower screw locations. Install the motor-mounting screws and route the wiring aft through the top opening of the motor mount toward the other wiring.

FINISHING TOUCHES

Install the motor arming switch and charging jack just aft of the cowl edge. Add the RX switch, its plywood guard and the battery-movement limiters as shown on sheet 2. Four 600mAh cells are used for motor power, and four 150mAh cells are used for the RX. Install the microservos as high as possible, leaving space under them for the 150mAh cells. A BEC speed control would save weight by eliminating the 150mAh RX cells.

Whichever version of the Skoots you build, I'm sure you'll love this little model. Have fun; go fly!

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

FLIGHT PERFORMANCE

by Stan Brock

Our club's field could not accommodate the Skoots' very small landing gear, so instead of an ROG, the first flight started with a hand-launch.

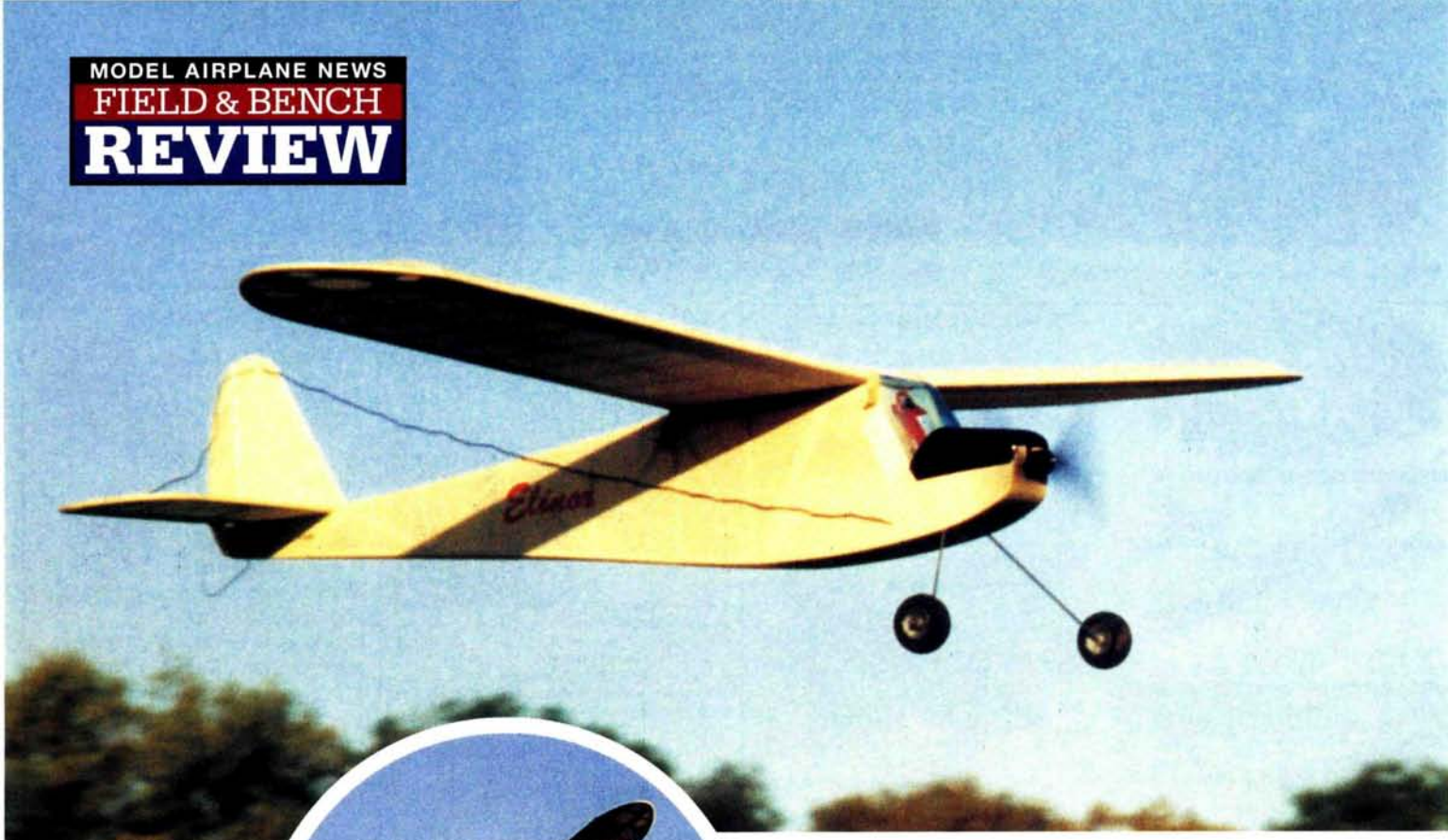
With the Cox .020 screaming on 15-percent nitro fuel, Jesse launched the Skoots with a one-step throw. Apprehension disappeared as the little Skoots headed straight out into a gentle climb. No trim changes were required. The model is a joy to fly; it can loop and roll (barrel roll) and do other no-aileron aerobatics for fun.

When the engine stopped, I made a long downwind leg and then a gentle 180-turn, and the model settled nicely onto the runway. After the first flight, I told Jesse, "Don't change a thing!"

Balance point: 2.25 inches aft of the front wing hold-down dowel

Control throws:

- **rudder: 3/8 inch left and right**
- **elevator: 3/8 inch up and down**



Classic lines in a prebuilt electric

by Bob Aberle

Hobby Lobby Intl.

Elinor

THE ELINOR IS A SPORT, electric-powered R/C model designed and assembled in the Czech Republic and imported to the U.S. by Hobby Lobby Intl.* It is so simple to assemble and fly that it makes a perfect R/C model for the rank beginner. If you recently made your first R/C flights on one of Hobby Lobby's slow flyers, then the Elinor is a perfect second model, as it is able to fly in stronger winds and at much higher altitudes.

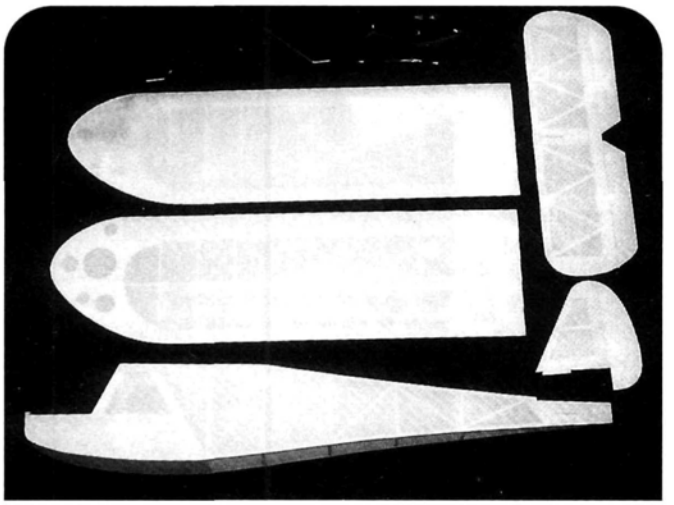
The Elinor resembles an old-timer aircraft that might have been popular in the late '30s. At first glance, you might think you recognize the old design, but that isn't possible because it was cleverly done as a "generic" old-timer. It has the general appearance of many of the vintage designs all wrapped up into a single aircraft.

The model comes essentially ready to fly. All of the structure is fully assembled and covered with a cream-colored, iron-on material that looks like fabric. It comes with just about all of the necessary hardware, including control horns, control rods, prebent landing-gear wire, wheels, wheel bearings, elevator-joiner wire, servo tray, motor mount, foam wheels and a molded plastic canopy. The rudder and elevators come covered and pre-hinged, with the covering used as the hinge material.

WHAT YOU'LL NEED

To help the R/C beginner, Hobby Lobby offers an accessory pack (part no. ART001AP) that includes a set of Speed 400 gold-plated electrical connectors, 5-minute epoxy, 60/40 rosin core solder, 12-gauge wire in two colors, a motor shaft adapter for the gearbox, rubber bands and a set of wheel collars.

Hobby Lobby recommends using a Graupner* Speed 400 6V motor for power. Because of the Elinor's size and weight, a gearbox is also recommended. I decided to use the MFA* Mini-Olympus with a 2.3:1 reduction ratio. The best prop for this motor/gearbox combination proved to be the Graupner 8x4 Slim Prop. Keep in mind that the power and R/C system com-



The basic structural parts of the Elinor. The open wood structure of the fuselage, wing, stab and fin/rudder are already covered by the kit manufacturer. The rudder and elevator come prehinged.

ponents must be purchased separately from Hobby Lobby; they are not part of the basic kit.

By using a speed control (ESC) with a battery eliminator circuit (BEC), only one battery pack is required to power both the motor and the radio system. Hobby Lobby has very cleverly suggested the use of its 8-cell, 1200mAh-capacity nickel-metal-hydride (NiMH) battery. The experienced E-power modeler will note the use of 8 cells, instead of the more usual 7 cells, to operate the 6V Speed 400 motor. As it turns out, the NiMH cells characteristically have more of a voltage drop when they heat up under load. The extra cell copes with this situation, yet still keeps the model "lively" in flight for a long time.

Just about any R/C system will fit in the Elinor. The Hitec* Flash 5 system with full-size HS-300 servos is recommended. I have a Hitec Focus-5 radio with a 555 micro receiver and two HS-85 miniservos, and by substituting these lighter-weight components, I was able to save 2.3 ounces in overall model weight. But quite honestly, the Elinor can easily take the extra weight. I proved this point on one flight by adding 2½ ounces of lead weight and noted no apparent effect on flight performance. So it is strictly your choice; use what you have on hand. Keep in mind that in this application I used only two servos: one for rudder and one for elevator.

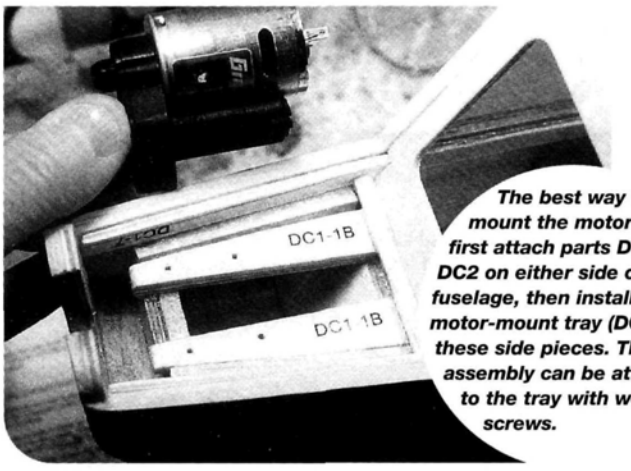
Hobby Lobby recommends that you use its Jeti* JES-10 controller with BEC. This ESC turns the electric motor on and off and also varies the speed in proportion to the throttle stick on the transmitter. It takes the place of the throttle servo that would be needed on a glow-powered model. The last item needed is a battery charger that's capable of charging the 1200mAh NiMH battery pack.

ASSEMBLING THE ELINOR

Total assembly time—from kit box to the flying field—was about two days, or approximately 16 hours. That included my photography time. Very few tools are required: you'll basically need a hobby knife (with no. 11 blades), a drill (with 1/16- and 1/8-inch bits), needle-nose and cut-off pliers, two small screwdrivers (conventional and Phillips types) and a soldering iron. You will also need 5-minute epoxy and some black paint for the inside of the canopy.

The provided assembly instructions are quite good. They include a listing of all the tasks, itemized by category and numbers which, in turn, correlate to a series of sketches on an 11x17-inch sheet. Everything is straightforward. Take note that parts are provided to mount everything from large servos to microservos; you select the right parts to mount the servos of your choice.

The only area in which I was confused concerned mounting the electric motor and gearbox to the forward fuselage; there seems to have been a slight disconnect between the task list and the diagrams. The best way is to mount parts DC1 and DC2 on either side of the fuselage, then install the motor mount tray (DC1 and DC1A) to these side pieces. The motor assembly is then attached to the tray with wood screws. A little common sense and patience will get you through this step.



The best way to mount the motor is to first attach parts DC1 and DC2 on either side of the fuselage, then install the motor-mount tray (DC1-1A) to these side pieces. The motor assembly can be attached to the tray with wood screws.

ELECTRICAL CONNECTIONS

As with most electric-powered models, you will have to do some soldering (connector and component wiring). To provide a mounting place for the Jeti ESC and the battery pack, I filled in the opening in the main bulkhead (at the wing leading edge) with some scrap plywood. I attached the Jeti ESC to the front side of this bulkhead using hook-and-fastener tape. On the rear side of this same bulkhead, I attached the battery pack (vertically), also using this same tape.

Observing proper polarity (+ and -), the two motor wires from the Jeti ESC were soldered to the Speed 400 motor terminals (negative goes to the terminal marked with the red dot because when using a gearbox, the motor rotation is reversed). The two motor leads coming from the Jeti ESC get passed though a hole in the bulkhead and are soldered to the Speed 400 gold-plated connector pins. Two more of these pins are soldered to the wires coming from the battery. Make sure the yellow bodies of these connectors are set to mesh together with the proper polarity. The on/off switch coming from

SPECIFICATIONS

Model: Elinor

Type: sport ARF electric park flyer

Distributor: Hobby Lobby Intl.

Wingspan: 54 in.

Wing chord: 8 in.

Wing area: 390 sq. in.

Wing loading: 10.8 oz/sq. ft.

Final weight: 29.4 oz.

Length: 35 in.

Motor used: Graupner Speed 400 w/6V winding (part no. GR3321) and MFA Mini-Olympus gearbox w/ 2.3:1 reduction ratio (part no. HLH783)

Battery used: 8-cell 1200mAh NiMH (part no. B1200N8)

Speed controller used: Jeti JES-10 with BEC (part no. HLJE10)

Motor run time: 8 to 8½ minutes (at full throttle)

Prop used: 8x4 Slim Prop (part no. GPS09050)

Radio used: Hitec Flash 5 555 micro receiver and two HS-85 servos

List price: $109

Features: the Elinor comes fully assembled and covered with a cream-colored, iron-on material that looks like fabric; the kit includes control horns, control rods, pre-bent landing-gear wire, wheels, wheel bearings, elevator joiner wire, servo tray, motor mount, foam wheels and a molded plastic canopy. The rudder and elevators come covered and pre-hinged.

Comments: the Elinor is an easy to build and fly kit and would make a perfect trainer or an enjoyable sport model.

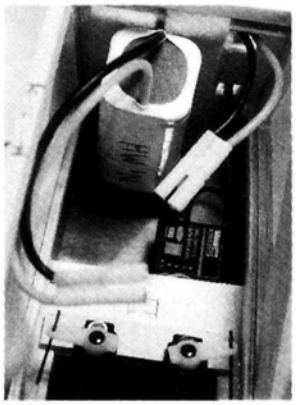
Hits
- Excellent quality kit.
- Nice flier for sport or beginner pilots.
- Attractive old-time design and covering.

Misses
- Some clarification in the instructions on motor mounting would have been helpful.

the Jeti ESC was mounted on the left side of the forward fuselage, just by the canopy seam line. The last cable coming from the Jeti is the servo lead that plugs into the throttle port on your R/C receiver. Make sure the 3-pin servo connector is compatible with the connector on your receiver. If not, you could easily cause a short circuit and ruin some components.

MOTOR CONSIDERATIONS

As I already pointed out, I mounted the battery pack in a vertical plane on the rear of the main bulkhead. If this pack were mounted any farther rearward, the model would not balance properly. No mention was made in the instructions about motor and ESC cooling. To take care of this, I first cut off the front end of the plastic canopy by the motor, then I cut a series of holes in the bulkhead to let the air pass through and last, I removed some covering material by the tail to allow the air to exit the model (see photos). To do the job correctly, you must consider both cooling air intake and exit.



An 8-cell 1200mAh NiMH battery pack is mounted vertically to the rear of the main bulkhead with the help of hook-and-fastener tape. When you're not flying, always keep the battery disconnected as shown.

NiMH battery cells are considerably lighter than comparable-size Ni-Cd cells. For example, this 8-cell, 1200mAh NiMH pack weighs 7.8 ounces; a similar capacity Ni-Cd pack might weigh 12 ounces and might make the difference in the Elinor's flight performance. So the choice of NiMH for this application was quite clever.

I found that the NiMH battery could easily be charged at the C/10 rate (120mA) overnight. I generally use this charge rate for my first flight of the day. At the field, I found it was possible to fast-charge the NiMH battery at a 2C rate of 2.4 amps for 30 minutes. Going at a higher rate would have quickly overheated the battery. I was also surprised to find that my most expensive charger would not properly fast-charge the NiMH battery; it produced many "false peaks" in 30 minutes. Yet my AstroFlight* 110D charger did the job perfectly every time (2.4 amps for approximately 30 minutes).

After each flight, you may find the battery pack to be quite warm. It is best to cool down the pack before recharging. I do this by inserting the battery pack into a 3-inch-diameter piece of PVC pipe with a 12V RadioShack fan mounted on one end..

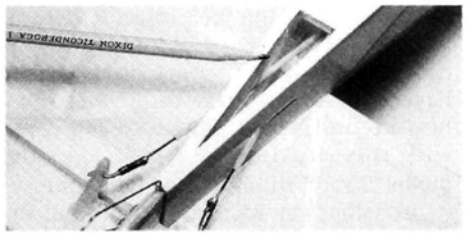
My experience has shown that the NiMH capacity rating isn't quite what it is claimed, especially when resorting to fast-charging. Instead of 1200mAh, I found this pack to be closer to 1050mAh, but that still offers a lot of flight time.

Motor current was measured at 8 amps, using the 8x4 prop turning at around 8,000rpm. That's fine for a Speed 400 motor and also fine for the NiMH battery, but don't consider taking 20 or 30 amps out of a NiMH battery. At 8 amps and with the cells rated at 1050mAh, the calculated motor run time was 8½ minutes. I was able to get 8 to 8½ minutes on the ground during my testing.

With the equipment located as shown in the photos, the Elinor balanced exactly as specified, 2½ inches back from the wing leading edge. Final control throw for the rudder was ¾ inch either side of neutral and for the elevator, ⅜ inch either side of neutral.

The area of the front canopy has been cut away to allow air to pass directly into the motor for cooling purposes.

I cut several cooling holes in the main bulkhead to allow the air to pass through. Note that the hole in the main bulkhead has been filled with a piece of scrap plywood. The Jeti ESC has been attached to that piece with hook-and-fastener tape. The Jeti on/off switch is mounted with pieces of scrap plywood.



At the rear, lower fuselage, I removed a piece of covering to allow the cooling air to exit. Also note the connectors attached to the control horns; they must be soldered to the wire control-rod ends.

FUN AT THE FIELD

The first flight session proved a total success. In fact, on the very first flight at sunrise—without the aid of any thermals—my Elinor put in a 15½-minute flight. A good deal of this was done with the throttle set at ½ power. Climb rate at full power is about 300 feet a minute, which is quite good when you consider that this is an almost 30-ounce model powered by only a Speed 400 motor. Handling was fine throughout the flights. I suggest for the future possibly adding a little more wing dihedral for the benefit of absolute beginners.

In summary, the Elinor is an excellent-quality kit that was manufactured with considerable care. The wood is all medium to hard, and the covering is very neat. A little more clarification for the motor mounting might prove helpful—a minor point! Based on my flight testing, the Elinor would be a perfect trainer model—even for the first-time R/C pilot. But as a beginner, please try to get an experienced modeler by your side for the first few flight sessions. The Elinor is also a wonderful sport model for those days when you just want to fly around by the hour and enjoy yourself.

FLIGHT PERFORMANCE

• TAKEOFF AND LANDING

Unfortunately, my local flying fields consist mostly of rough or uncut grass, so it's difficult for a small model to take off from the ground (ROG). As a result, to date I have hand-launched all of my flights with the Elinor. It takes only a few steps and a gentle throw to get the model into the air. Climb-out is relatively slow and steady, giving the beginner or sport pilot a chance to anticipate what to do next.

The Elinor's slow speed, floating characteristics and precise turning qualities make it easy to land.

• GENERAL FLIGHT CHARACTERISTICS

I'd guess that the rate of climb is approximately 300 feet per minute. To conserve a little battery power, you may find it desirable to throttle back to ½ or ¾ throttle when at a higher altitude. At that point, I found the Elinor could still maintain altitude and provide much longer flight times. Flights of 15 minutes' duration, without the aid of thermal activity, were possible.

With the light wing loading of approximately 10 ounces per square foot, the Elinor is a good floater despite the overall drag of the model design. It will also do a few basic maneuvers, such as a loop or a barrel roll, without much difficulty. Generally, for loops, you have to dive the model first to gain enough speed and then pull back on the stick.

The light wing loading also permits some good controlled slow flights. You also have to go some to get it to stall, and when it does, it is a "soft" stall. All and all, this is a very enjoyable model to fly.

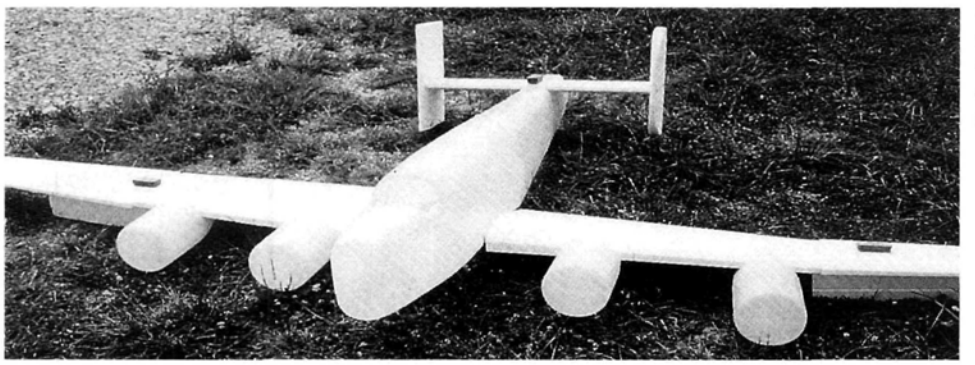
*Addresses are listed alphabetically in the Index of Manufacturers on page 158.

 by George Leu

Hinging and hand-painted markings

One facet of our scale models is often overlooked: hinge installation. A hinge is often attached to a control surface with plenty of glue, but there just isn't enough supporting wood around it to make a good glue joint. We often see elevators and ailerons fly off airborne models because the hinge installations failed. Why not install them more securely?

To properly install and support a hinge, before covering a structure, add enough surrounding balsa to completely support the hinge. This might be as easy as simply gluing a balsa block in front of and behind the control surface's leading and trailing edges. With the blocks glued into place, drill or slot the surfaces, and hinge them as required.



Above: Dave Wigley poses with his impressive Hawker Tempest Mk. V. The Quadra 75-powered fighter was built from Vailly Aviation plans. Left: the American Eagle B-17 Flying Fortress is a beautiful modeling project. With a span of 123 inches, the 1/10-scale bomber weighs about 35 pounds. Below: also from American Eagle is this 132-inch-span, fiberglass and foam B-24 Liberator kit.

Use plenty of glue to completely cover the hinge surface and ensure that it is properly attached to the wood. Pacer's* Hinge Glue works very well; it's specially formulated to stick well to the plastic most hinges are made of, and it's water-based, so it makes the wood around the hinge swell and mechanically hold the hinge in place.

In foam wings, too, make sure the outer wooden surfaces are deep enough to support the hinges properly. If there is little wood to work with, use more hinges, and use epoxy to bond them to the foam and the wood. Keep those hinges (and control surfaces) securely attached; the model you save may be your own.

TERRIFIC TEMPEST

While attending the 1999 Warbirds over Long Island event, I met Dave Wigley from Smithtown, NY, who flew a beautiful 45-pound Hawker Tempest Mk.V powered by a Quadra* 75 engine turning a 24x12 prop. Built from Vailly Aviation* plans and finished in fiberglass cloth and automotive lacquer paints, it was impressive. Dave's craftsmanship was obvious, and according to his documentation, every rivet, panel line and paint color was right on. Dave says he used many of the "scale techniques" shown in this column, and he's pleased with his results—as he should be!

BEAUTIFUL BOMBERS

More and more, we see truly impressive, multi-engine bombers at warbird meets. For truly big models, the 123-inch-span B-17 Flying Fortress and the 132-inch-span B-24 Liberator from American Eagle Model Aircraft* are hard to beat.

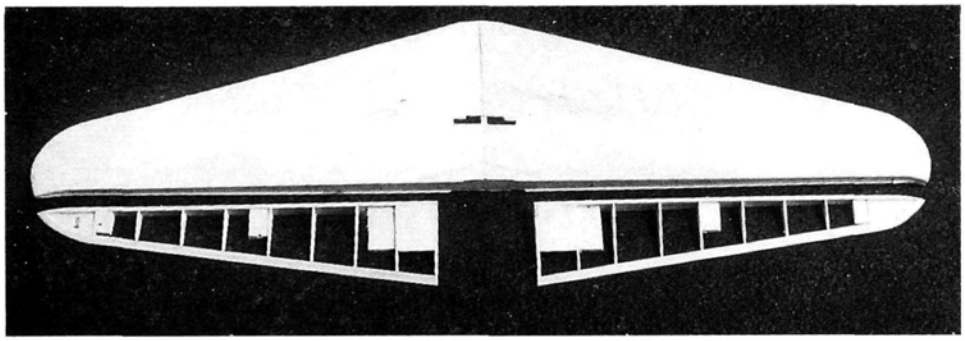
Operated by Bob Neider, American Eagle is about 10 years old and offers approximately 25 designs, including fighters. The company's B-17 and B-24 bombers have fiberglass fuselages and foam wings and stabs. Both come with canopies and engine cowls, were designed for four, .40 to .50 2-stroke glow engines and have a flying weight of around 35 pounds. Though I have never flown a big bomber, the flight characteristics of these models are said to be "very comfortable"; they surely look awesome!

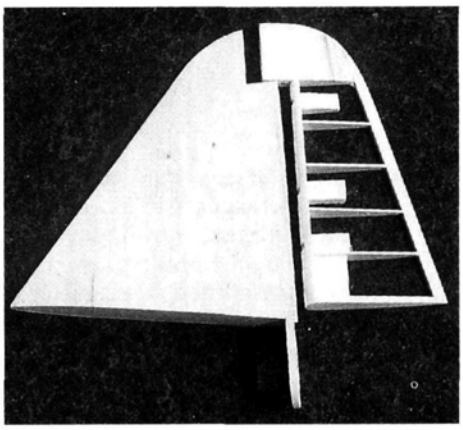
PLUG-IN WING PANELS

I have received a few emails requesting information on plug-in wing panels and how the hardware required for this design should be installed. Such panels make transporting even the largest models much more manageable, and they're easier to incorporate into your design than you might think. The photos of my Ziroli* Hellcat wing illustrate how they work.

Detachable wing halves were originally developed by glider guys whose sailplanes have very long wings that have to fit in their cars. Well, that's also why giant-scale warbird designers have incorporated the plug-in concept into so many popular model designs; it's especially prevalent among models that span more than 80 inches.

There are several versions of the plug-in wing, and each was designed specifically





To ensure proper strength, add balsa support blocks at the hinge location. If there is nothing for your hinge to be glued to, the installation may fail.

to address the needs of a given model type. On WW I biplanes, the outer panels plug into a center wing section, and dowels going through holes in plywood ribs keep everything aligned. Metal straps and rigging wires supply the necessary strength.

On big warbirds, to support the flying surfaces, the plug-in wing relies on a very strong, aluminum, carry-through tube that has a diameter of about 1½ inches and a wall thickness of from 0.050 to 0.062 inch. For a typical 90- to 100-inch wing, this tube is about 3½ feet long. The tube fits snugly into well-fitting phenolic or fiberglass guide tubes that have been glued into the wing ribs. These guide tubes bridge several ribs and, in most cases, for strength, the ribs are made of plywood, not balsa. Also, at both ends of the mating ribs, there are two short dowels that function as "locking" or "anti-rotation" pins. The panels are held on the tubes with locking screws or cap-head bolts that thread into the tubes (usually from underneath the wing for appearance's sake).

There are several variations on this theme: some designers use two shorter aluminum carry-through tubes while others use more than one for each panel.

In all cases, the carry-through and guide tubes are installed during construction and before the wing has been sheeted. Some designs simply have an aluminum tube supported by holes in the plywood

DRAWN-ON MARKINGS

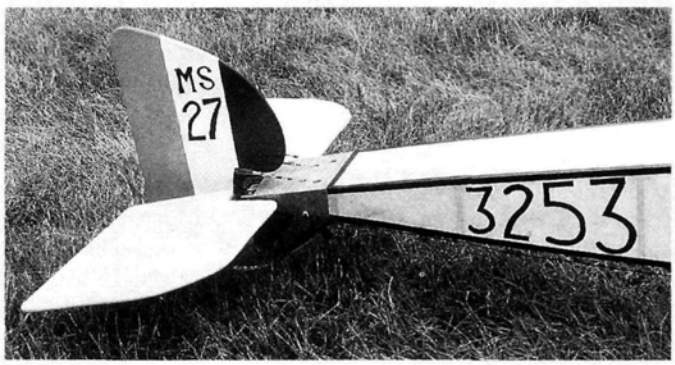
This month's simple technique is perfect for most models of antique, WW I aircraft. The full-size aircraft were simple in design and were also hand-finished and painted. As the War went on, skilled workers became scarce, and field mechanics often acted as the artists who painted the markings on the aircraft. At best, their "freehand" lettering looked hurried and was not as sharp as factory-applied markings, but it's easy for us to replicate, and it offers a simple way to give your WW I aircraft that "used" look. Here's how I do it.

Here, I am finishing a 3 Sea Bees* Morane-Saulnier Type-L parasol aircraft with the serial number that was painted on Royal Flying Corp. pilot Warneford's aircraft. It's on the back of the fuselage.

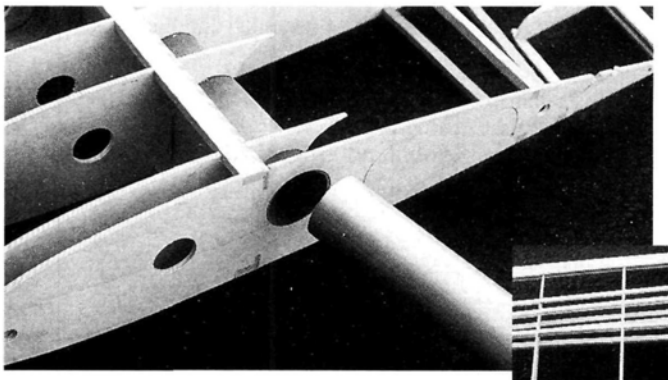
With documentation in hand, I first pencil in the letters and numbers. Having marked their locations and shapes to my liking, I neaten my lines with a French curve and a Top Flite* panel-line marking pen. The pen produces a line that's about 1/32 inch thick, and this is wide enough to allow the rest of the lettering to be painted within the lines.

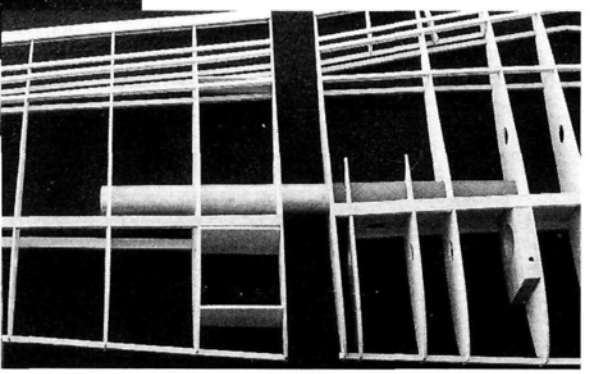
The final effect was exactly what I wanted for the Morane, and the ink is compatible with most paints. (Here, I used dope.)

Try the "drawn-on" markings technique; it is a lot easier and quicker than using frisket mask or masking tape, and it looks hand-drawn because it really is!



This technique is very simple and offers that "antique" look. Draw the outlines of your letters and numbers with a Top Flite panel-line pen, then paint within the outlines. Since the hand-painted markings on vintage planes were far from perfect, your model will look more true to scale with similar, "amateur-look" markings.





Top: a wide, strong, aluminum carry-through tube slips into an outer guide tube that's built into the wing before the wing has been sheeted. Bottom: plug-in wing panels are very convenient for transporting your giant-scale model. Here's the installation in the wing of my Ziroli Hellcat.

ribs; others have guide tubes that run the entire length of the carry-through tubes. If you are scratch-building a design that does not have plug-in panels and you want to incorporate the feature, you can purchase the tubes from several places including Aeroplane Works*.

HOW MUCH IS TOO MUCH?

Like all of you, I love building and flying model airplanes. For more than 30 years, the hobby has been my greatest form of recreation and enjoyment, while it has also been a wonderful vehicle with which to express my modest mechanical and artistic skills. In my pursuit of the hobby, I have acquired more kits and partially completed models than I could ever possibly build. I just can't pass up a good deal. Do you know the feeling?

Often, to get out from under so many overwhelming projects, you need an "inventory reduction plan." This is how I did it: I listed all my kits and projects, and I could see where my interests had wandered over the years. I came up with four categories of interest: ducted-fan jets, WW I aircraft, WW II "heavy iron" warbirds and sport/pattern models. With list in hand, I quickly identified projects I had little or no interest in completing. My inventory-reduction plan then became an inventory-reduction sale.

I sold my unwanted wares and quickly put the cash to good use by purchasing items such as retracts, engines and radio equipment for the projects still in the basement. It's a funny thing: with fewer projects to complete, I feel much better because my list of projects is more manageable, and I know that I will finish most of the remaining projects as I had originally planned. Sometimes, less is more. If you find yourself wondering where all the shelf space in the shop has gone and you have way too many projects clamoring for your attention, think about reducing your inventory. Finish the kits you have before buying that next great deal!

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

MODEL AIRPLANE NEWS
ENGINE
REVIEW

The Brison 3.2 is a user-friendly, big-bird engine with excellent power and performance.

Brison 3.2

A 50cc powerhouse for sport and competition

by Gerry Yarrish

AFTER ATTENDING MANY IMAA and giant-scale warbird fly-ins over the years, I've seen a lot of gasoline engines put through their paces. The most popular engine by far is the single-cylinder variety, and there are several excellent brands to choose from. Ask any of the many pilots who fly at these events, and you'll find that most have quite strong feelings about certain brands of engines. One engine that always seems to be in the "I love it" category is Brison Aircraft's* 3.2 engine. Let's take a closer look.

The Brison 3.2ci (52.32cc) engine is a very attractive, nicely detailed powerplant. Its satin-finished aluminum cylinder is complemented by a blue-anodized, two-piece crankcase. The cylinder is Nikasil-lined; it and the piston assembly are made by Makita/Dolmar USA, and that ensures excellent quality throughout. The 3.2 is not a converted industrial engine; its case is CNC-machined and was designed for model aircraft use. It is also drilled and tapped for use with a diaphragm smoke pump. Like the case, the engine-mount plate, the prop hub, prop washer and throttle/ignition advance bellcrank are all anodized with a blue finish.

The Brison 3.2's parts are made with the highest quality and craftsmanship. All parts are available separately.

The 3.2 is equipped with a manual, throttle-coupled spark-advance system and a CH electronic-ignition module. Also included are a machined, twin-outlet smoke muffler, spark plug, oil mix, Deep Groove main ball bearings, conrod needle bearings and a Walbro pumper carb with all throttle linkages in place.

INTERNALS

In its most basic description, the Brison 3.2 is a piston-ported, twin-bypass-ported engine. The Nikasil lining is a nickel/silicon plating on the inside of the aluminum cylinder, and the bypass ports are cast as part of the cylinder body. The external finish appears to be glass-bead-blasted.

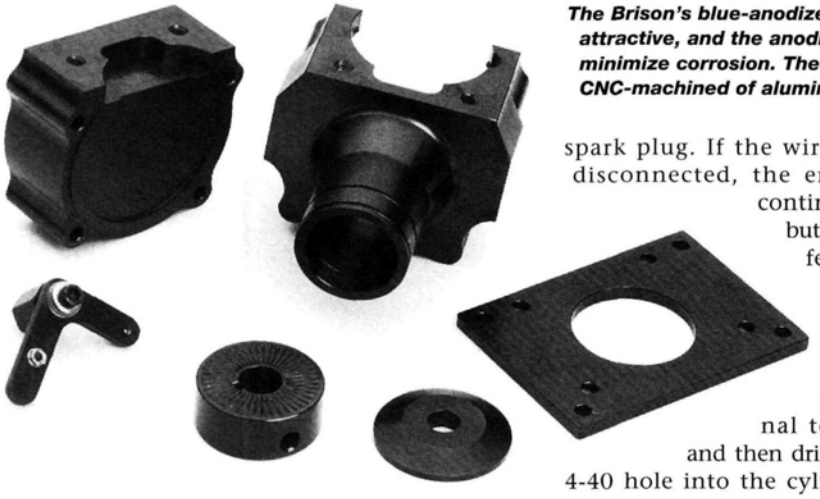
The piston features a square ring and a flat-head profile. Its external surfaces are machined, and much of the side-skirt area is eliminated, thereby producing a strong, light unit. The connecting rod, also machined, is equipped with INA caged needle-bearings at both ends (10mm upper and 12mm lower), and the wristpin is retained with twin music-wire retaining ring clips.

The cantilever crankshaft is machined from tough 4340 steel and has a sturdy, pressed-in crankpin. Twin, German-made NTN ball bearings support the crank; the front bearing is retained by an internal 1.125-inch-diameter snap ring. The prop hub is locked onto the crank with a cut-in square key. The case is sealed with a 15x32x7mm synthetic crank seal. The rear case cover is also machined from aluminum, and much of its 1.125-inch thickness is machined away to save weight. Its thin rear wall design keeps case volume to a minimum.

INTAKE AND IGNITION

The 3.2 breathes through a big-bore no. 34 Walbro carb that sits opposite the exhaust port. The carb sits on top of a plastic extension block and is held in place with two 5x60mm screws. Two gaskets effectively seal the carb and extension block.

The manual spark advance ring and the throttle bellcrank are very simply designed and very reliable. The bellcrank attaches to the case and is supported by a robust, hex-shaped extension block. Attached to the case with an 8-32 cap-head bolt, the bellcrank also has two 4-40 threaded rods and ball-link clevises that attach it to the carb and advance ring. The ring is made of nylon and houses the CH ignition Hall sensor. The ring sits squarely on the front housing of the case and is held in place between two steel 1⅜-inch-diameter



The Brison's blue-anodized parts are attractive, and the anodizing helps minimize corrosion. The case is CNC-machined of aluminum.

retainer rings that fit into two square-shouldered grooves machined into the case. The Hall sensor's triggering magnet is installed in the prop hub.

The CH ignition module attaches to the Hall sensor pick-up lead with a Deans connector and has two power leads that need to be attached to your switch harness. I installed a JR charging jack so I could simply plug in my switch harness and use it to turn the ignition system on and off. This simplifies maintenance by allowing me to charge both the radio and ignition battery with the same charger. The ignition system requires 4.8 volts to operate, and the ignition battery should have at least an 800mAh capacity. If model weight is not a problem, a 1200mAh (or larger) capacity is recommended.

The engine timing is factory-set at between top dead center (TDC) and 4 degrees before top dead center (BTDC) at the idle position and between 28 and 30 degrees BTDC for the high-speed position. The engine timing can be changed by adjusting the length of the timing linkage that connects the white timing ring and the carb. Lengthening the linkage advances the timing while shortening it retards the timing.

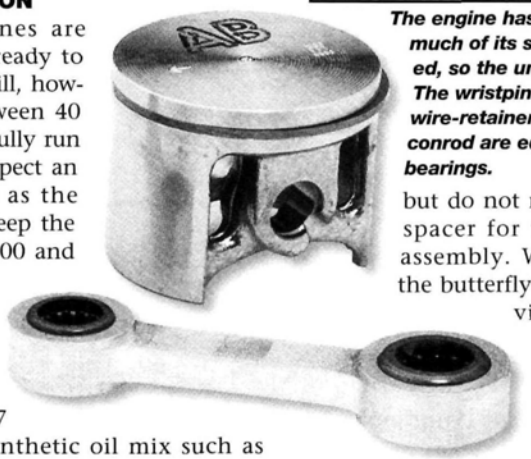
The spark-plug boot has a braided ground wire connected to it that must be attached to the engine for proper operation. A simple way to attach the ground wire is with a hose clamp: tighten it over the wire and the lower, hex-shaped portion of the spark plug. If the wire becomes disconnected, the engine will continue to run, but radio interference may increase. I prefer to crimp or solder an end terminal to the wire and then drill and tap a 4-40 hole into the cylinder's top cooling vane and attach the terminal with a pan-head screw. (Crimping the terminal to the wire is preferable, as engine vibrations can break a soldered ground wire.)

The spark plug supplied with the 3.2 is a Bosch, WSR 6F resistor plug, and it should be gapped at 0.020 inch.

OPERATION

All Brison engines are factory-run and ready to fly. The engine will, however, require between 40 and 50 hours to fully run in, so you can expect an increase in rpm as the engine is used. Keep the prop between 6,500 and 7,500 (static) for best torque. For fuel, use regular leaded or unleaded gasoline (I use 87 octane) and a synthetic oil mix such as Ansoil or Klotz Modelube (Brison's recommendation). If you use a good, high-quality oil mix, use a gas/oil ratio of from 50:1 up to 100:1. If you use a bargain-brand oil mix, use a ratio of from 32:1 to 40:1 to provide sufficient engine lubrication.

The engine comes with a carb-return spring that prevents the engine from overspeeding if positive throttle control is lost. You can disconnect this spring if you like, but do not remove it; it acts as a spacer for the carb's butterfly assembly. Without this spring, the butterfly can work loose from vibrations and might come apart; not a good thing.



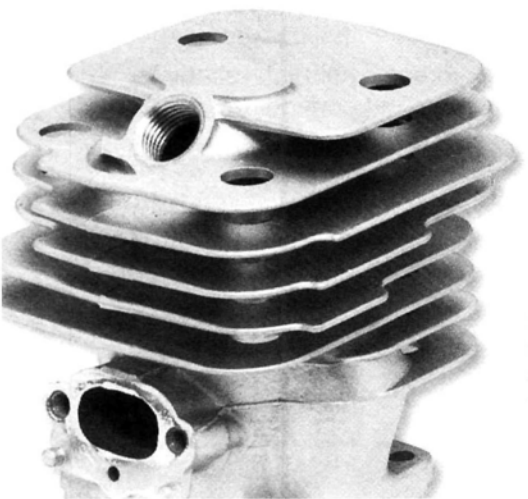
The engine has a ringed piston, and much of its skirt has been eliminated, so the unit is light yet strong. The wristpin is retained by twin wire-retainer clips. Both ends of the conrod are equipped with needle bearings.

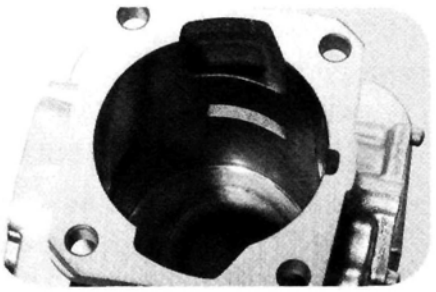
Wrap the CH ignition module with ½-inch-thick foam as you would an RX and mount it as far away as possible from the radio system and servos. Install the throttle servo at least 8 inches from the engine and use a plastic throttle pushrod, as a metal cable will bring engine noise directly into the RX.

STARTING

The best starting procedure for the engine is to have a friend hold the model after you've made certain that the tank is full and the ignition system is energized. Close the choke, open the throttle slightly (about 1/16 inch) and flip the engine through several times until it burbles. The engine will not start with the choke closed. Open the choke and flip the prop over again. The engine should start on the fifth or sixth flip and settle into a nice, slightly high idle.

Allow the engine to warm up for several minutes before you make any adjustments to the needles. If the engine hesitates when the throttle is applied, the idle mixture is too lean. Shut the engine down and





The cylinder has a satin, glass-bead-blasted finish and is from Makita/Dolmar USA. It is lined with Nikasil, a tough nickel and silicon alloy plating.

SPECIFICATIONS

Engine: Brison Aircraft 3.2

Type: gasoline

Displacement: 3.2ci (52.32cc)

Bore: 1.733 in. (44.01mm)

Stroke: 1.340 in. (34.06mm)

Lenght: 5.75 in.

Width: 5.24 in.

Height: 6 in.

Weight: 3.25 lb.

Ignition: electronic (CH iginition included)

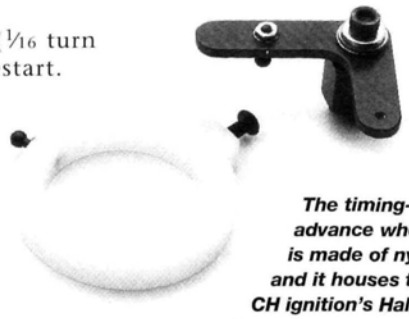
Prop shaft: single bolt (3/8-24NF)

Price: $349 (including electronic ignition and muffler)

Comments: the Brison Aircraft 3.2 is a high-quality, excellent running, big-bird powerplant. Its mechanical spark-advance ring offers simple, trouble-free operation and exceptionally smooth throttle transition response. The engine comes complete, factory-run and ready to fly. A muffler, spark plug, oil mix and CH ignition system are included.

BRISON 3.2

open the low-end needle (1/16 turn counterclockwise) then restart. You're looking for a smooth transition to fully open. The idle mixture (low-end) needle settings should be between 2 and 2½ turns out, and the high-end needle setting should be between ½ and ¾ turns out.



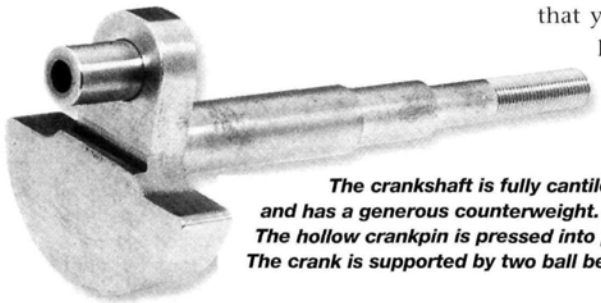
The timing-advance wheel is made of nylon, and it houses the CH ignition's Hall-effect sensor.

Use a tachometer to check the top-end rpm and adjust the high-end needles until you get max power. Then back the needle off 1/16 turn to slightly richen the mixture. Though the engine is factory set up and run, the props you use and the general atmospheric conditions can affect the engine's performance, so always check your engine with a tachometer.

The engine burns between 1 and 2 ounces of fuel per minute, so remember this when choosing a tank. Install a 20-ounce tank for 10 minutes of flying. Since the Walbro carb is a pumper carb, tank position is not critical to the engine's performance; just make sure that you set up the tank properly and use gasoline fuel line and tank plumbing.

The Brison 3.2 gasoline engine is a very user-friendly big-bird powerplant with excellent power and performance. The engine is a good choice for aircraft that weigh between 15 and 25 pounds, depending on the model's wing loading. It is a very popular engine for many IMAA-legal models, both sport-aerobatic and military. Give it a try; I think you'll put it in your "I loved it" category.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*



The crankshaft is fully cantilevered and has a generous counterweight. The hollow crankpin is pressed into place. The crank is supported by two ball bearings.

ENGINE PERFORMANCE

I first ran the 3.2 using its factory needle settings. After I ran the series of props, I richened both needles 1/16 turn (counterclockwise) for best performance. Except where noted, all props are wood.

Prop	High-speed rpm	Idle rpm
DynaThrust Classic** 20x8	9,200	1,350
Clark Industries 20x6	8,700	1,600
Zinger 20x8	8,600	1,600
Zinger 20x10	7,750	1,450
Clark Industries 24x6	6,800	1,300
Zinger 22x12	5,900	1,350

**black composite prop

Weather conditions
Temperature: 77° F (25° C)
Relative humidity: 79%
Barometer: 29.96 inches (1014.45 millibars)

MODEL AIRPLANE NEWS
HOW TO

Make Fiberglass Parts with Clay Molds

JUST LIKE FULL-SIZE aircraft, model aircraft need fairings to look good and to make them more aerodynamically efficient. My 50-percent-scale Extra 300 shown here looks very true to scale because of the fiberglass fairings I added, and I'll show you how to make them—in a way that you might not have thought of.

One-off parts, quick and easy

Sculpting with clay is one of the most ancient of arts, but have you thought of combining it with modern composite layup techniques? When you're making one-off parts, clay can be very useful; it's cheap and easy to work with. Here's how I use it to make fiberglass fairings for my models.

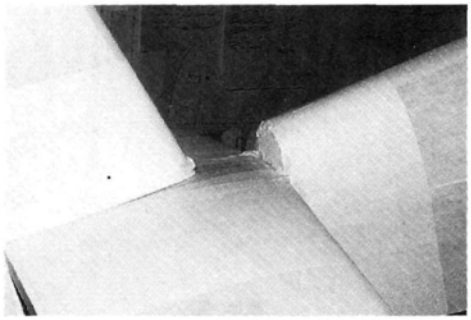
by Jacques LaPointe

YOU'LL NEED:

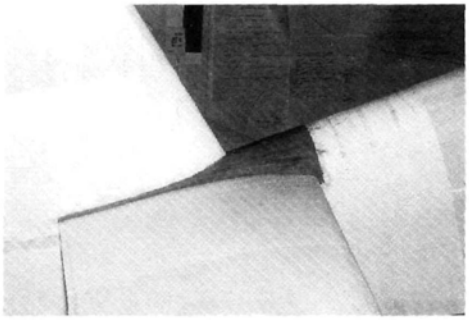
- Modeling clay—Plasticine or Clean Clay—from an art-supply shop.
- Medium-weight and lightweight fiberglass cloth.
- Epoxy molding resin.
- Masking tape.
- PVA (polyvinyl alcohol) mold-release agent.
- A variety of wooden sculpting tools; smoothing tools are especially helpful when making fiberglass fairings.

For this article, I made a fiberglass fin-to-fuselage fairing and landing-to-fuselage cuffs. Let's get started.

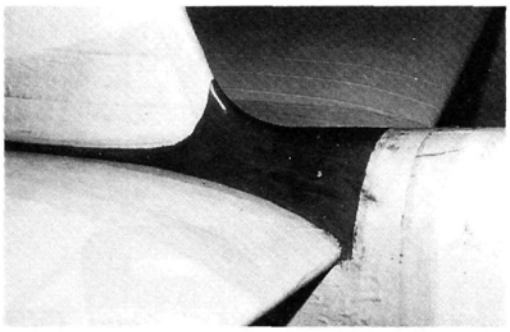
FIN FAIRING



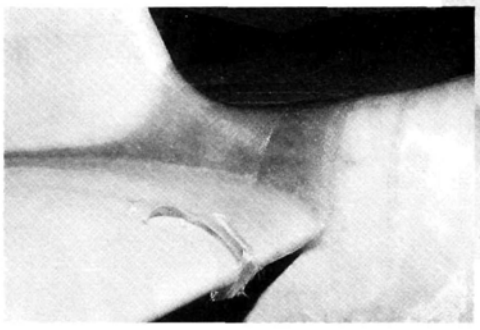
1. After you have built the fuselage and tail parts, attach the control surfaces to the fuselage and mask off the surrounding areas as shown here. This will prevent the PVA mold-release agent from soaking into the wood, and it will make clean-up a lot easier.



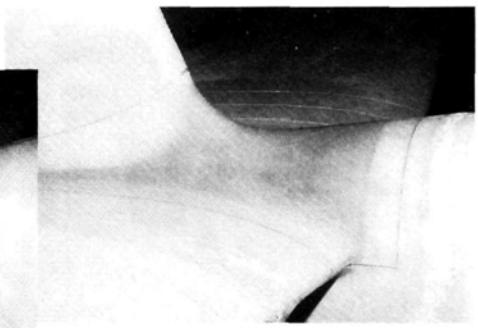
2. Work the clay into the fairing area, and build it up until you have enough to mold into the shape you want. Follow the airframe's natural lines, and work carefully to ensure a smooth final fairing shape.



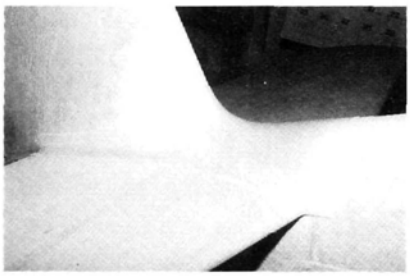
3. The clay fillet has been shaped to blend smoothly into the leading edge of the fin and the top of the aft turtle-deck area. When the clay is as smooth as it can be, apply several coats of PVA and allow it to dry. (Be careful to follow the directions that come with the PVA.)



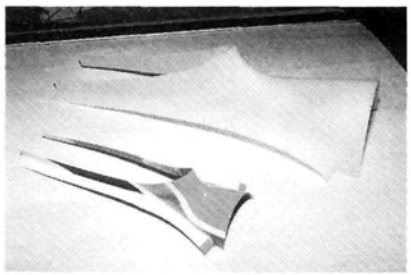
4. Cover the clay and the surfaces around it with a layup of the fiberglass cloths (two weights) and molding resin. Apply the medium-weight cloth first and then the lighter one, and you'll have a smooth final surface. Apply resin only to the surfaces that have been coated with PVA, and then allow it to set.



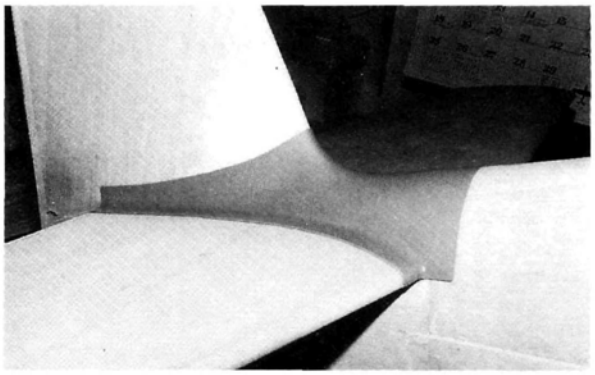
5. When the resin has set, sand the fairing smooth and draw its final shape with a pencil. Remove the waste cloth, and then gently "pop" the fiberglass part off the clay. It should easily separate from the model.



6. With a Dremel* cut-off tool and a grinding disc, cut the fairing to an approximate shape, then sand it to final shape. Work slowly to avoid damaging the part. Here, the masking tape and clay have been removed from the model, and the new fiberglass fairing has been put into position.

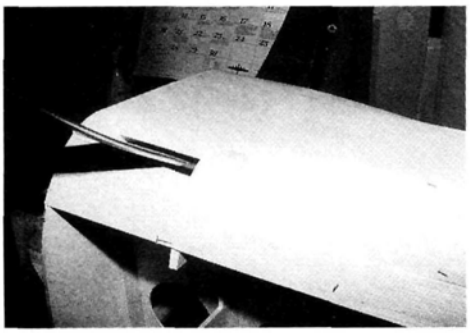


7. Our new part is shown here with a smaller, fin-to-fuselage fairing I made for another model. Once it has been primed and painted, it will match your model's finish perfectly.



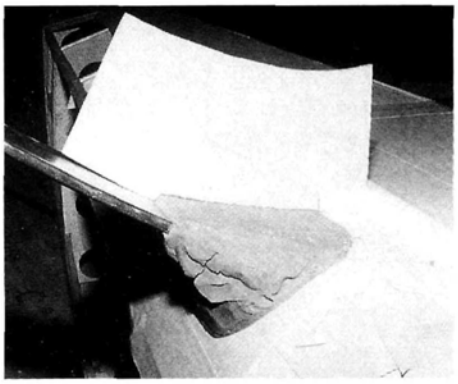
8. Here, the fairing has been primed and is ready for final finishing, after which it can be glued permanently into place or attached with small screws so that it's removable. It's up to you.

LANDING-GEAR CUFFS

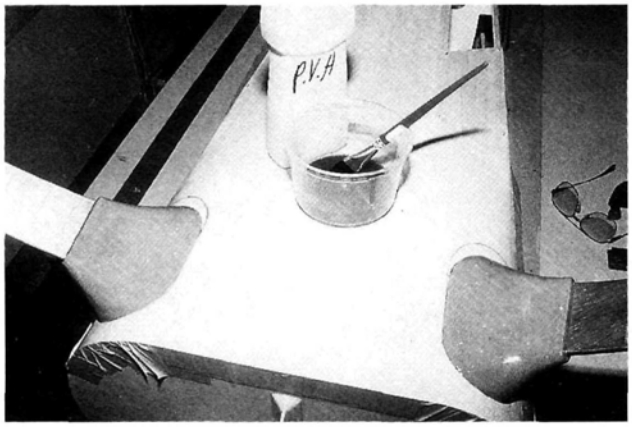


1. The same process is used to make the landing-gear cuff fairings. Here the gear is in place, and the balsa fuselage sheeting has been added where it's needed.

2. Apply masking tape to the surrounding balsa, and build up the clay around the base of the gear leg.

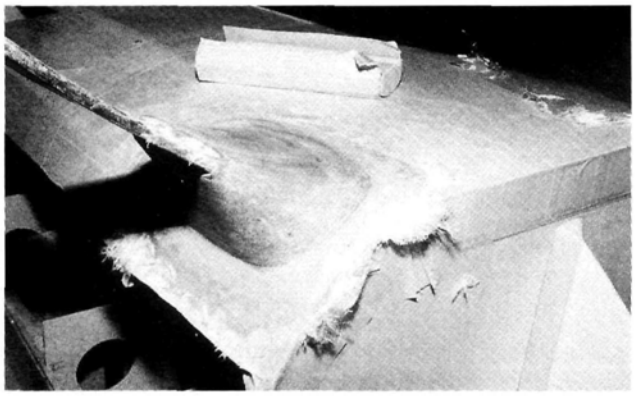


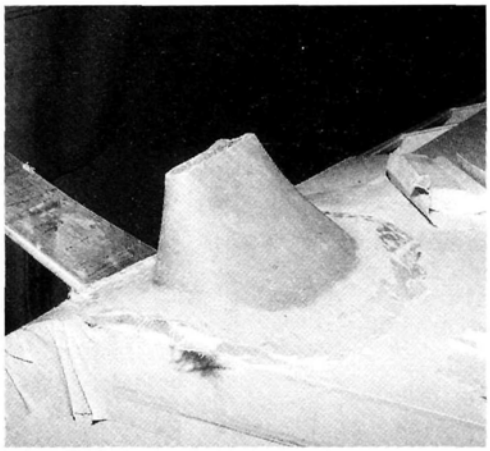
3. When making two fairings, use a plywood shaping template. A template will allow you to "trowel" the clay into shape, and both fairings will be of roughly the same shape and size. Note the guide stick used to position the template.



4. Here, the PVA is being applied to the two landing-gear cuffs and the surrounding areas. The PVA has also been applied several inches past the edge of the clay and onto the landing-gear legs.

5. The fiberglass cloth has been applied and is saturated with molding resin. To minimize sanding, take your time when applying the cloth. Smooth it carefully into place to avoid having any wrinkles or bubbles.





6. Far left: when the resin has set, sand the fiberglass to shape. Start with rough, 60- to 80-grit paper, then finish-sand with 150- then 220-grit paper. Use a rounded sanding block to smooth the underside of the cuffs.

7. Left: here, the landing-gear cuff has been removed from the clay and is ready for final shaping and sanding. Prime and paint it, then attach it to the model with small screws.

The finished Extra 300, complete with custom-made fiberglass fin and cuff fairings, is off on another flight. You can make any fiberglass part you like with clay and glass cloth; it takes only a little time and your imagination.

**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

Troubleshooting tips

I RECENTLY HAD AN experience with a newcomer that I'd like to share. I'm not trying to make fun of him or his abilities; as a matter of fact, I was quite impressed with the progress he had achieved on his own. This novice showed up at our field seeking help after going at it alone for some time. He was having problems with his heli's setup and complained that he was always "fighting" with it. After I quickly looked at the model to be sure there weren't any obvious faults, he fired it up. The first thing I noticed was that he started the engine at ½ throttle. He said this was the only way the engine would start. Of course, this engages the clutch and places a strain on it and the clutch liner. When I told him this, he replied that he had already replaced the clutch because it had worn out. He lifted the heli up and the first thing I noticed was that the head speed was far too low. This caused the heli to respond sluggishly. The next thing I noticed was how smooth the heli was; he had obviously built it well and with care. To further evaluate the heli, I took a turn at the controls. First, I increased the head speed using the hover pitch and hover throttle knobs on the transmitter; we would take a more detailed look at the pitch and throttle curve programs later. When I hovered the model, two things were very evident: the throttle curve was not matched to the pitch curve and lagged behind it, and the controls were very, very sensitive—no wonder he was always "fighting" with it.

This is one view the novice pilot wants to avoid: nose in!

PHOTOS BY RICK BELL

Proper positioning is demonstrated here. Note that the heli is only several inches off the ground with the tail pointed at the pilot.

To fix these problems, we first checked the programmed throttle and pitch-curve values. The values were OK—nothing out of the ordinary. Next I looked at the ATVs and found that the throttle ATV was maxed out on both the high and low ends. This led me to the mechanical setup, where I found the problem: it was not linear and lagged behind the pitch curve ("Regarding Rotors," October '99, offers a more detailed explanation of this). In other words, not enough power was coming in at hover pitch, so it was like trying to make a car go uphill from a stop in fifth gear. To correct this, we first reset the throttle ATV to default values, set both the throttle and servo arms to 90 degrees and adjusted the pushrod length. We adjusted the throttle ATVs to prevent binding at low and high throttle, and guess what? The helicopter could now be started at low stick with the trim lever at ½. So far, so good. Before we hovered it, we reset the adjustment knobs on the transmitter to neutral. When we did hover the model again, the head speed was almost perfect. It only needed to be slowed down a bit, which we did by going into the throttle curve and decreasing the value at mid-stick.

Remember I said that the controls were very sensitive? Well, that turned out to be because reverse exponential had been programmed in. We got rid of the reverse exponential and hovered the heli again. The results were like night and day: no more "fighting" with this heli. The heli owner now hovered his model and could not believe how much better it was working.

I hope this story will help you to troubleshoot problems you might be having with your model. My experience with this novice pilot also illustrates the need for a beginner heli pilot to find an experienced instructor and avoid these difficulties.

MORE HOVERING EXERCISES

In the October '99 column, we discussed some hovering exercises for beginning pilots. By now, you should have gained more control of the heli and be able to hover it several inches off the ground within a 5-foot "box." At this stage, I recommend that you keep the heli 6 to 8 inches off the ground, unless you feel comfortable at a higher altitude. Let's work to keep the heli hovering in one spot. One trick that I used when I learned how to hover was to take off and land on a small throw rug. This also gave me a reference point to keep the heli in a single spot while hovering.

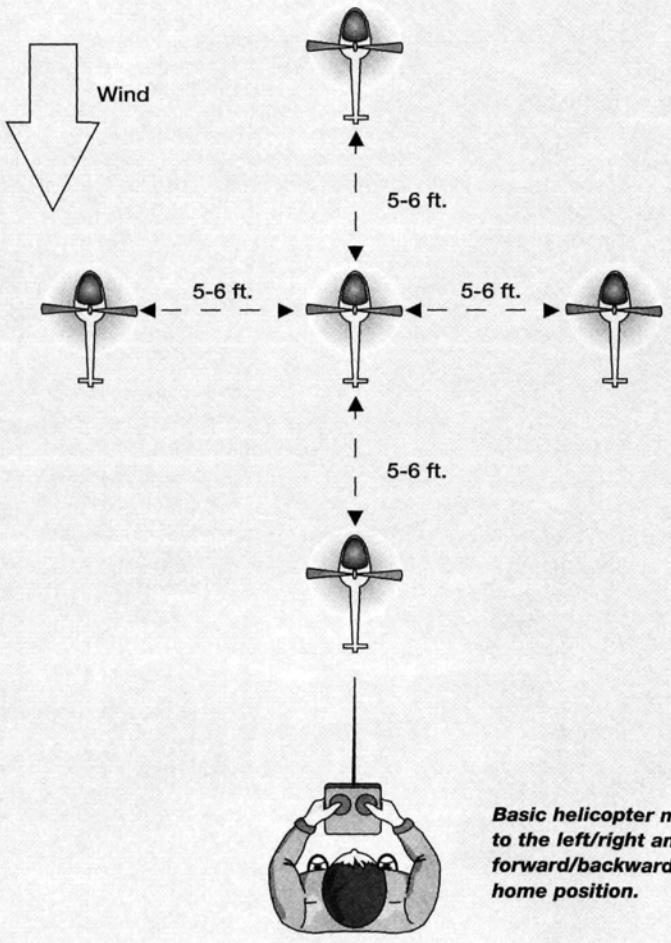
Bring the rotor up to speed so that the heli becomes light on its skids but

Rodney Roy (left) and Tim Bourgeois with their helicopters. Both have just started learning to hover.

doesn't lift off the ground. This is where a controlled hover starts. Notice that if the rotor disc isn't level as the heli lifts off, it will follow the tilt of the rotor disc. So level the disk before lifting off. Now apply a little more throttle/collective; the heli will start to lift. As it gets to the height you want, slightly lower the throttle/collective to hold that height.

Now really work at keeping the heli in one spot for about 30 seconds or so. As soon as you notice the heli starting to drift, apply the inputs to correct it. This will be very difficult at first but will become easier as you keep at it. When the heli is back on the ground, think about what you just did: how did you correct the heli movement? What did you do right or wrong?

Figure 1



Basic helicopter movements to the left/right and forward/backward from the home position.

In other words, analyze your performance.

Keep practicing, and as you get better, start to increase the hovering height. When the heli is approximately 1½ rotors above the ground, you will be out of ground effect, and you'll notice that hovering it becomes easier. Keep practicing until you can hover for a full tank. It will take some time to achieve this, but it's very important to do so before moving on.

THE NEXT STEP

Begin by getting the heli into a stable hover, and gently apply right cyclic and move the heli to your right until it's about 5 or 6 feet away (see Figure 1). Stop the movement with left cyclic and again obtain a stable hover. Bring the heli back by reversing the process. As soon as the heli is back in front of you, again obtain a stable hover. Now repeat the process to your left. You will notice that it takes very little stick movement to start the heli moving, and as it moves, its speed can increase very quickly.

Now that you can move left and right, do the same thing moving forward and backward. Start from a stable hover, move forward 5 or 6 feet, stop, obtain a stable hover, and bring the heli back to you. If at any time you feel uncomfortable moving the heli around, land it and start again. These exercises are the foundation to building your hovering skills.

Keep practicing, and next time, we'll put your new hovering skills to work. Remember, fly safely and with purpose.

THE NEXT HELI HOTSHOTS?

Over the last few months, I started teaching two new heli pilots to hover. Rodney Roy and 12-year-old Tim Bourgeois each started with a .60-size machine and JR* 8103 radio. Rodney flies a Futura* Super Sport and Tim flies a JR Ergo 60 Sport. They're having a great time learning to hover. Ray St. Onge (one of the best 3D pilots in the country) is also a member of our club, and when he's not traveling doing demos, he spends the day at our field fine-tuning his machine or working on some new, wild 3D trick. It's truly amazing to watch someone of Ray's caliber fly a helicopter in every way that you can think of. He's amazing to watch: inside to outside maneuvers with pirouettes in a blink of an eye, then the model goes backward inverted. One thing to remember is that Ray started out like the rest of us: learning to hover as Rodney and Tim are doing now. Perhaps they could be the next 3D experts?!

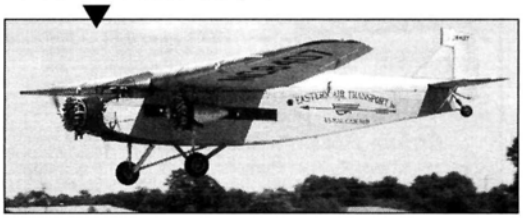
**Addresses are listed alphabetically in the Index of Manufacturers on page 158.*

NAME THAT PLANE

Can you identify this aircraft?

Send your answer to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Congratulations to Robert F. Macy of Cherryvale, KS, for correctly identifying the October '99 mystery plane, the Ford 4-AT, better known as the Tri-Motor. It was manufactured by the Stout Metal Aircraft Co. (it became a division of Ford in 1925). The Tri-Motor's wingspan is 74 feet with a fuselage length of 49.9 feet. Within its 475-mile service radius, the plane's 300hp Wright Whirlwind engines pull it to a blistering cruise speed of 104mph. The Tri-Motor could accommodate 11 passengers (all guaranteed a window *and* an aisle seat), and it also served yeoman's duty in cargo configuration. This particular plane served as a mail carrier in 1929 for Eastern Air Transport of Brooklyn, NY. The airplane eventually became the unfortunate victim of a tornado. Through the tireless efforts of the EAA, it has been restored to its present-day beauty, as seen here flying at AirVenture in Oshkosh, WI.



The winner will be chosen four weeks following publication from correct answers received (delivered by U.S. mail) and will receive a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free, one-year extension of his subscription.

Index of Manufacturers

21st Century fabric; distributed by Great Planes (address below).

3 Sea Bees Models, P.O. Box 747, Lake Stevens, WA 98258; (425) 334-6089; fax (425) 397-2126.

Aeroplane Works, 2134 Gilbride Rd., Martinsville, NJ 08836; (732) 356-8557.

Aero-Crafted Models, 2713 Summit View, Bedford, TX 76021.

Airtronics, 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540.

American Eagle Model Aircraft, 4608 Chastant St., Metairie, LA 70006; (504) 455-5487.

Anchor Bond; distributed by Anchor Seal, 16 Riverside Ave., Danvers, MA 01923; (978) 774-5217; fax (978) 774-0638; www. anchorseal.com.

AstroFlight Inc., 13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637; www.astroflight.com.

Brison Aircraft, 12075 Denton Dr., Ste. 11, Dallas, TX 75234; (972) 241-9152; fax (972) 241-5065.

Bob Violett Models (BVM), 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020; www.bvmjets.com.

Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (773) 626-9550.

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A micro brushless DC motor

Phil Smith is a retired electromechanical engineer in Adrian, MI. For those lucky enough to know him, every meeting or phone call is always a great learning experience. During the past half dozen years, Phil has concentrated his efforts on developing electronic circuitry to support the new thrust into micro R/C. When we meet every year at the KRC E-Fly, the Toledo Show, or the E-Nats, Phil Smith always has something new to show, such as his own version of an infrared micro R/C system, several types of tiny magnetic actuators, or even an electric-motor speed controller that weighs only a gram or two.

At the recent AMA E-Nats in Muncie, IN, Phil couldn't wait to show me his latest design creation: a micro-size, brushless, DC electric motor. If that didn't catch your attention, let me say it one more time: a *micro-size brushless DC electric motor that's capable of powering an equally micro-size R/C or free-flight model aircraft*. It's only a start and, as Phil describes it, this is only a proof-of-concept prototype.

The current micro-size brushless DC electric motor as developed by Phil Smith. Although it's still somewhat large, it is about the size of this quarter. If this whets your technical appetite, why not give Phil a call to ask for more details? His phone number appears in the text.

The photos that I hastily took between contest flight rounds at the E-Nats tell most of the story. Four rare-earth magnets are placed on a rotating disc made out of printed circuit (PC) board. The magnets are roughly ¼ inch in diameter and ⅛-inch thick. The PC board rotor is epoxied to a wheel-collar-type hub, then to an ⅛-inch-diameter shaft. This shaft is ball-bearing-supported.

Phil operates this experimental brushless motor on 4 cells (5 volts) with a current drain of about 250mA (¼ amp). Although the present configuration would lend itself well to a gear drive, this first prototype just uses simple direct drive.

Power output is claimed to be only on the order of 1 to 3 watts, but this could easily be increased to power some of the smaller parking-lot models. Phil bought a Hall effect surface-mount component from Digi-Key, the national mail-order electronics parts specialists. In fact, everything Phil used on this project is readily available.

You might ask: why go to the trouble of making a tiny, brushless DC motor to power a 1- or 2-ounce indoor R/C model? Well, the brushless concept does offer certain advantages:

- a wider voltage range (in this case, 3 to 7 cells);
- zero break-in time;
- long service life (something the little coreless motors can't claim!);
- less chance of causing electric noise feedback into the micro R/C system;
- a motor that can be retimed quite easily for optimum performance.

Phil's experimental motor is a little cumbersome, but he thinks that it can be improved. The final motor design won't end up as small as a pager motor (8/10 gram), but it will still be very light. He'd like to make it ½-inch-square and possibly have up to several amps' motor current.

Phil would like to communicate with modelers who share his desire to experiment with this type of motor technology. His home phone number is (517) 263-4572, and he will gladly take calls weekdays from 10 a.m. till 9 p.m. EST. This is just another example of the kind of progress we look forward to in R/C model aviation during the next millennium.

PHOTOS BY BOB ABERLE

The new prototype micro-size brushless DC motor is roughly in the center of the photo, surrounded by the 4-cell battery pack and several of the experimental sensor units that are being developed by Phil Smith.

Phil Smith holding a new, electric-powered replica of a 1940 rubber-powered model, the "Gollywock." This model does not have the micro brushless motor in it; but next year, it just might! This particular model is powered by a Speed 400 motor running direct drive on an 8x3½ prop cut down to 7 inches in diameter. It has a wingspan of 30 inches and an area of 135 square inches. It weighs around 14 ounces with a wing loading of 15 ounces per square foot. Five- to seven-minute flights can be obtained on a 7-cell, 500 AR pack.